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ABSTRACT

This curriculum guide is composed of 16 lesson plans about terminology and concepts relevant to the four major methods of handling solid waste problems: (1) reuse; (2) recycling; (3) conversion of waste to energy ; and (4) landfilling. Games, investigations, a play, projects, a slide presentation, and skits are some of the teaching techniques utilized in the lesson plans. Each lesson follows a general format as follows: (1) purpose; (2) time; (3) materials; (4) preparations before the meeting; (5) background information; (6) lead-in; (7) procedure; (8) processing; (9) extensions; and (10) student worksheets. Lesson 1 is an introduction to the concept of solid waste, its categories, and related measurement terminology. The relationship between solid waste and natural resources is explored in lesson 2. The term litter is presented in lesson 3. In lesson 4 alternative methods for solid waste handling, management, and disposal are identified. Lesson 5, about natural cycles, leads into lessons 6 through 8 on recycling. The concepts and goals of composting are introduced in lesson 9. Lessons 10 through 12 introduce the incineration process and the relationship between energy and waste. The final lessons, 13 through 16, present landfills and associated issues. A glossary, an answer section, and 20 references are included. (MCO)

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Mystery of the Cast Off Caper

4-H Solid Waste Leader's Curriculum Guide

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INTRODUCTION

Clues to the "Mystery of the Cast Off Caper"

Welcome, detectives, to the "Mystery of the Cast Off Caper." Your jobs will be to solve the mystery of where our garbage goes and what can be done to solve this national problem.

Teachers and leaders will be the chief detectives. It's your job to provide the setting and clues to help the junior detectives (students and 4-H members) solve the mystery. As you go through the mystery you will find that the mystery meets requirements for teaching basic competency skills as well as addressing the solid waste problem.

Through hands-on activities or learn-by-doing activities, junior detectives will be involved in solving the "Mystery of the Cast Off Caper."

As you move through the mystery you will find that there are four major methods to handle solid waste problems: 1) reuse 2) recycling 3) conversion of waste to energy and 4) landfilling.

Don't forget to call in special investigators if you need help. These could be your local Agricultural Extension Service agent, recycler, Keep America Beautiful coordinator, county engineer, or landfill operator. You will also find that the junior detectives will enjoy going to the "site of the crime": school grounds, recycling centers, and the landfill.

This publication was printed on recycled paper.

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Lesson 1: What Is Solid Waste?

Purpose:

1. To define the term "solid waste."
2. To describe the categories of solid waste.
3. To develop the concept of a "ton" and to equate it with something familiar to students.

Time: 45 minutes

What You'll Need:

1. Paper products
2. Yard wastes
3. Food wastes (potato peels, apple cores, and so on)
4. Glass
5. Metal
6. Plastics
7. Old NiCad batteries (flashlight batteries)
8. Classroom trash
9. Textile articles (socks, shirts, and so on)
10. Garbage can and student worksheets
11. Bathroom scales
12. Seven paper bags to categorize trash
13. Pencils for each student

Before the Meeting:

1. Ask each student to bring a bag of "clean" trash (no food scraps, unrinsed cans, and so on) either from home or from the school grounds.
2. Read the lesson plan and underline the key points that you want to emphasize.
3. Collect listed materials.
4. Set up scales and bags.
5. Distribute worksheets.

Background Information: The United States produces more waste per person than any other country in the world. To get a sense of just how much solid waste we produce, consider the following facts:

- The average citizen generates 3 to 5 pounds of garbage a day. Over the course of a year, that amounts to 1,400 pounds per person.

- Americans produce 154 million tons of garbage every year. That is enough to fill the New Orleans Superdome, top to bottom, twice a day, 365 days per year. Disposing of that waste cost about $4 billion in 1978. In many cities, expenditures for waste

management were second only to those for education.

- Each year, Americans throw away approximately 60 billion cans, 28 billion bottles, 4 million tons of plastic, 10 million tons of yard waste, 40 million tons of paper, 100 million tires, and 3 million cars.

- Typically, solid waste contains about 42 percent paper, 23 percent yard and food wastes, 10 percent metals, 9 percent glass, 7 percent plastic, and 9 percent other materials.

- Although more than half of our solid waste could be recycled, we are currently recycling only about 10 percent. Denmark recycles an impressive 60 percent of its waste.

- The single largest component of what people throw away is paper. The average American uses 580 pounds of paper a year, the highest rate of consumption in the world. Making that paper requires somewhere between three and six trees, each weighing close to 500 pounds.

- Solid waste management programs are outlined in the laws and rules of federal, state, and local governments. Federal guidance is provided in the Solid Waste Disposal Act of 1965 and the Resource Conservation and Recovery Act of 1970 and 1976. In addition, North Carolina has passed an Act to Improve the Management of Solid Waste. These laws will affect what we put in the garbage can.

Lead-in: What would happen if the garbage man didn't come to your house next week? (Give students a chance to respond.) What is solid waste? (Solid waste is anything we put in our garbage can, at curb side, or into the landfill.) How many of you know what a ton is? (Get responses.) For those of you who may be unsure, we are going to use trash to help demonstrate.

Procedure:

1. Weigh the filled garbage bags and the child. Weigh the child alone and calculate the difference.
2. Label paper grocery bags by category: *paper, yard waste, food waste, glass, metal, plastic, other.*
3. Select one bag of garbage to be sorted.

4. Ask students to pick up each piece of garbage and put it in the appropriate category bag.
5. Weigh each category bag in the same manner as you did in step one.
6. Have students determine what percentage each bag contributes to the total weight. How do these percentages compare with "The Nation's Trash Can"? Have the students record their answers on the student worksheet 1.1.
7. If we had this much paper in one day's trash, how much will we have in a year? Do the same for aluminum cans.
8. Relate "ton" to the trash they have weighed. Tell them 20 children would weigh approximately a ton. You might weigh each class member and keep a cumulative total.

Let's Talk About It:

1. What have you learned about solid waste? (Let students answer.)
2. Give me the names of the seven categories of solid waste. [Let students respond. If any categories are omitted (paper, yard waste, food waste, glass, metal, plastic, and other) supply the missing names.]
3. Who makes solid waste? (Students should answer, "We all do.")
4. How many bags would we need before we had a ton of waste?

Where to From Here?

1. Weigh the solid waste your family puts into the garbage for a week or a month. Determine the weight of solid waste that your family will have in a year.
2. Determine the weight of glass that is placed in your family's garbage in a week or a month.
3. Determine the weight of paper products that are placed in your family's garbage in a week or a month. Be sure to consider magazines, newspapers, boxes, and so on.
4. Determine the weight of food scraps left in your school's cafeteria each day for one week. If the same amount is left each week for a school year, what is the total amount of waste?

What is Solid Waste?

Weight in Pounds		Percentage of Total Waste	
_____	glass	_____	
_____	metal	_____	
_____	yard waste	_____	
_____	paper	_____	
_____	food	_____	
_____	plastic	_____	
_____	other	_____	
_____	Total pounds	_____	Total

Nation's Garbage Can

My Garbage Can

Insert your own percentages and compare them to the nation's.

Lesson 2: Trace The Trash

Purpose:

1. To identify the major groups of natural resources (animals, fossil fuels, metals, plants, trees, and sand).
2. To identify the various natural resources used to produce a specific article of solid waste.

Time: 1 hour

What You'll Need:

1. Motor oil in a small baby-food jar
2. Small container of sand
3. Glass bottle (1 quart)
4. Newspaper
5. Aluminum can
6. Paper cups
7. Plastic or plastic foam cups
8. Picture of a forest
9. Plastic bag with orange peels, egg shells, and apple cores
10. Copies of Trash Card Bingo for each student

Before the Meeting:

1. Review the following terms: *natural resource, renewable resources, nonrenewable resources.*
2. Review rules for Trash Card Bingo.
3. Select 15 trash words from the Trash Card Bingo Answer Sheet.

Lead-in: Here are two products, a glass bottle and a container of sand. How are they related? Let's look at these two products, a bottle of petroleum and a plastic cup. How are they related? Here are two more products, a newspaper and a forest. How are they related?

Procedure:

1. List six categories of natural resources: animals, fossil fuels, metals, plants, trees, and sand.
2. Have the students brainstorm a list of natural resources and then place the various items into these categories.
3. Review Trash Card Bingo rules.
4. Play Trash Card Bingo.

Let's Talk About It:

1. What is a natural resource? Are natural resources represented in solid wastes? Why or why not?
2. Can recycling and reuse programs reduce consumption of natural sources? How?
3. What are some renewable resources?
4. What are some nonrenewable resources?

Where to From Here?

1. Have students collect trash and identify its raw material.
2. Have students follow a natural resource from raw material to finish product. Here are some suggested end products:
   - Paper
   - Iron/Steel
   - Aluminum
   - Plastic
   - Glass
   - Synthetic and natural textiles
3. Have students prepare a bulletin board showing the various stages in the production of a particular product.

Trash Card Bingo Game

Games Rules:

1. Give each student a game sheet.
2. Select trash words from Answer Key for Trash Card Bingo and call out words one at a time.
3. Students write the trash word in the space under the correct natural resource. There may be more than one natural resource for each trash word. For example, a pair of tennis shoes might fill three categories: plant, fossil fuel, and metal. If the shoes are leather, animals could also be listed.
4. The first student to fill the card wins. Use the T-R-A-S-H as free spaces.

TRASH CARD BINGO				
ANIMALS	FOSSIL FUELS	METALS	PLANTS/ TREES	SAND
		A		
T				H
	R		S	

TRASH CARD BINGO				
ANIMALS	FOSSIL FUELS	METALS	PLANTS/ TREES	SAND
		A		
T				H
	R		S	

TRASH CARD BINGO ANSWER SHEET						
	ANIMALS	FOSSIL FUELS	METALS	PLANTS/ TREES	SAND	COMMENTS
1) aluminum can			X			Aluminum comes from bauxite ore.
2) aluminum pie pan			X			
3)aluminum lawn chair		X	X			The frame is metal. The web-bing is plastic.
4) apple core				X		Apples grow on trees.
5) bicycle tire		X	X	X		Most tires are made from rubber, which comes from trees. The spokes and rim are metal or plastic.
6) book				X		Paper is made from wood chips mixed with water.
7) bread				X		Bread is made with grain.
8) cereal boxes				X		Cereal boxes are made from light cardboard.
9) clothes hanger		X	X	X		Hangers can be made of metal, plastic, or wood.
10) corrugated cardboard box				X		Cardboard, like paper, is made from trees.
11) cotton shirt				X		Cotton is a plant.
12) egg shells	X					Eggs come from chickens.
13) flowers				X		
14) gift box & wrapping paper				X		
15) glass bottle					X	Glass is made from limestone and water.
16) glass jar with lid			X		X	The jar is glass. The lid is metal.
17) glass jug					X	
18) grocery bag		X		X		Grocery bags are made from paper or plastic.
19) leather shoes	X					Leather comes from animal hides.

Trash Card Bingo continued						
	ANIMALS	FOSSIL FUELS	METALS	PLANTS/ TREES	SAND	COMMENTS
20) leaves				X		
21) magazine				X		Most magazines are made from paper.
22) mail				X		
23) margarine tub		X				Plastics are made from fossil fuels and water.
24) meat scraps	X					
25) milk carton		X		X		Milk cartons are cardboard coated with plastic.
26) mirror		X	X	X	X	The frame is made of plastic and the mirror is glass.
27) newspaper				X		
28) nylon pantyhose		X				Nylon is a type of plastic.
29) paper towel tube				X		
30) phonograph record		X				Records are made from hard plastic.
31) 2-liter soft drink bottle		X				
32) sandwich bag		X				
33) plastic toy		X				
34) potato peels				X		
35) Syrofoam food container		X				Styrofoam is made from plastic.
36) tin can			X			Most food cans are steel with tin plating. Some drink cans are steel with aluminum ends.
37) toaster			X			Most toasters are made from aluminum or stainless steel.
38) toothbrush		X				Most toothbrushes are made from plastic.
39) wooden table				X		
40) wool hat	X					Wool comes from sheep, goats, or other animals.

Lesson 3: Litter Is Waste Out Of Place

Purpose:

1. To identify litter as "misplaced waste."
2. To locate particular areas where litter is a problem.
3. To recognize that littering results from a particular attitude.
4. To instill in students a sense of personal and community responsibility for conserving their environment.

Time: 30–45 minutes

What You'll Need:

1. Litter survey sheets
2. Between four and eight large trash bags for collecting litter
3. Pencils
4. Bulletin board materials and available bulletin board

Before the Meeting:

1. Review the Background Information and underline the points you want to emphasize.
2. Divide the class into four groups.
3. Divide the grounds into four quadrants, assigning one group to each quadrant.
4. Assign a team captain to each group.
5. Review the concepts of responsibility and citizenship.
6. Prepare the bulletin board so the litter can be attached after the survey.
7. Plant trash throughout grounds, if necessary.

Background Information:

We all have a responsibility to take care of what has been given to us in our environment. Problems occur when we develop one of these three attitudes:

- I don't own this property.
- Someone else will pick it up.
- The place is already messy. Why should I bother being careful?

Lead-in:

Just a quick look around the classroom, school grounds, and your neighborhoods shows us that litter is everywhere. What is litter? (It is solid waste that man has misplaced.) Where does litter come from? (Some sources include pedestrians, motorists, loading docks, construction sites, households, uncovered trucks, and commercial sources

such as restaurants, hospitals, and industry.) Who is responsible for solving litter problems? (We as citizens have the responsibility to take care of what has been given to us in our environment.) There are six main categories of trash. Do you know what they are? (glass, paper, aluminum, metal, yard waste, food waste, plastics) How can we help beautify our schools and neighborhoods? Remember, if we stop littering, we stop litter.

Procedure:

1. Divide into groups and assign captains.
2. Assign a group to each area and give them a time schedule (approximately 15 minutes).
3. Distribute a litter survey sheet to each group. One child in each group should be the recorder.
4. Have the recorders mark the survey sheet, indicating the location of each piece of litter. Note the number of pieces in each area listed on the survey. Also, have them list the number of waste receptacles in their area.
5. Have the students collect the litter and report what they find to the recorder.
6. Once all four groups are done, compile the data by group into one survey sheet to determine the most littered areas on the grounds.
7. Use the litter to create a bulletin board showing other students and staff where the school's trouble spots are located. The bulletin board will help to raise awareness and thus prevent liter.
8. Properly dispose of litter not used in making your bulletin board.

Let's Talk About It:

1. What are some of the categories of litter we found?
2. Where do our biggest litter problems occur?
3. What could we do to help improve these problem areas?
4. Who do you think is littering?
5. What have you learned about responsibility toward public or private lands?
6. Where are some places you can be a responsible citizen? (in school, in the car, on a picnic, on a fishing trip)
7. What can we do to help improve our environment? (pick up litter ourselves, encourage friends and family to pick up litter, and recycle)

Where to From Here?

1. Have students make artistic bumper stickers or posters that advertise litter control at school and home.

2. Get a speaker from a local organization (such as Keep America Beautiful, the Beautification Committee, the Garden Club, and the Agricultural Extension Service) to talk to the class or group about beautification.
3. Let several classes volunteer to be responsible for beautifying a certain area of the school or school grounds. They could plant trees, shrubs, or flowers.
4. Write legislators in your state asking them to strengthen litter and recycling laws.

Grounds Litter Survey

Group #_____
Area _____
Date _____

AREA	TYPE OF LITTER	NUMBER OF PIECES
Playground		
Fence		
Flower beds		
Sidewalks		
Parking lot		
Dumpster area		
Grassy areas		
Classroom doorways		
Building exits		
Trash can areas		
Other areas:		

Total pieces of litter _____
Total trash containers in area _____

Cumulative Survey Sheet

Type of litter	Group 1	Group 2	Group 3	Group 4
METAL				
Pop tops				
Cans				
Wire				
Toys				
PAPER				
Newspaper				
Notebook Paper				
Cardboard				
Labels				
Candy Wrappers				
GLASS				
Bottles				
Jars				
PLASTIC				
Bottles				
Caps				
Cigarette Butts				
Styrofoam Cups				
NUMBER OF RECEPTACLES				
TOTALS				

Lesson 4: Out of Sight, Out of Mind

Purpose: To familiarize the student with alternative methods for solid waste handling, management, and disposal.

Time: 30–45 minutes

What You'll Need:

1. Slide projector with tape player
2. Slide and tape set "Taking Out The Garbage" (available from the county office of the Agricultural Extension Service)
3. Trash Trivia game questions (Questions and answers are included. Answers are indicated with an * or they are written out.)

Before the Meeting:

1. Read Background Information.
2. Preview slide and tape set "Taking Out The Garbage."
3. Read the Trash Trivia rules.

Background Information: The population of the United States continues to increase. Simultaneously, the volume of solid waste continues to grow. Communities dispose of solid waste in three ways: recycling, incinerating, and landfilling.

Recycling processes waste products into marketable forms for eventual reuse.

- *Aluminum Cans:* Recycled aluminum reduces the need for additional raw material; it thus conserves whatever energy would have been required to produce new aluminum. In fact, it takes less energy to recycle aluminum than to manufacture it.
- *Paper Products:* Thirty percent of the paper produced today is being collected and recycled. Recycled paper conserves trees and energy and reduces water consumption.
- *Glass:* Bottles and jars are collected and remelted with raw materials to produce new glass products, thus saving raw materials and energy.
- *Plastic:* Two types of plastic products are frequently recycled: polyethylene terephthalate (PET) and high density polyethylene (HDPE). PET is used in soft drink bottles. HDPE is used in milk jugs. PET fibers are used as insulation for sleeping bags and as a base for the manufacture of other plastic products. HDPE can be recycled to produce refuse containers, flower pots, and plastic pipe.

- *Organic Waste* or *Compost:* Organic waste products can be mixed and processed to produce humus or mulch. The potential harmful components decompose into carbon dioxide and water. Heat is produced in this process, which reduces the concentration of potential pathogens to safe levels.

Incineration converts waste to energy; it produces heat that may be used to boil water or to turn a turbine that will generate electricity or steam.

Landfilling disposes of solid waste by burying it. Ultimately, all nonrecyclable solid waste residuals end up in a landfill.

Lead-in: What do you think when you hear the phrase, "Out of sight, out of mind"? This phrase is often used to talk about solid waste disposal. Today we are going to see a slide presentation that shows some alternative methods of solid waste disposal. See if you can identify three basic methods.

Procedure:

1. Show slide set "Taking Out The Garbage."
2. Trash Trivia game: Separate the class into two groups. Direct each question to one of the two teams, alternating as you proceed. If one team gives a wrong answer or does not know the answer, the other team will have a chance to answer that same question. The game ends when one team reaches a predetermined number of correct responses.

Let's Talk About It:

1. What are the three methods of waste disposal? (landfilling, incineration, recycling)
2. What is one advantage and one disadvantage of each of these methods?

WASTE DISPOSAL	ADVANTAGES	DISADVANTAGES
Landfilling	It is a safe and effective way to store solid waste.	Landfills are expensive to build and operate.
Incineration	It may produce energy.	It produces emissions and ash.
Recycling	It conserves natural sources.	It can be time consuming.

Where to From Here? Take a field trip to a landfill, a waste treatment center, or green box location.

Taking Out The Garbage

SLIDE #	PICTURE	SCRIPT
1.	Woman taking out garbage (comic)	(MUSIC) "Garbage Blues" Stanzas 1 & 2
2.	Kid taking out garbage	(MUSIC)
3.	Industry taking out garbage	(MUSIC)
4.	Restaurant taking out garbage	(MUSIC)
5.	Taking out garbage	(MUSIC)
6.	Taking out garbage	(MUSIC)
7.	Garbage collector garbage	(MUSIC)
8.	Landfill garbage	(MUSIC)
9.	Taking out garbage	Taking out the garbage can be a drag.
10.	Football field (26,000 imposed)	Each year Americans throw away enough trash to bury 26,000 football fields in a layer of garbage 10 feet deep.
11.	Writing paper stack	Americans throw away enough writing paper each year to build a wall from Los Angeles to New York City.
12.	Yard waste	Each year we dispose of 24-million tons of leaves and grass clippings.
13.	Airplanes	We throw away enough aluminum to rebuild a commercial airfleet every three months.
14.	Person reading Sunday paper	More than 500,000 trees are used to produce just one Sunday's newspapers.

SLIDE #	PICTURE	SCRIPT
15.	Line of garbage trucks	Each day 50,000 garbage trucks are at work hauling away the trash that is created in communities throughout our nation.
16.	School lunchroom	Each day Americans throw away 400-million pounds of edible food.
17.	Soft drink bottle	Each hour Americans throw away 2.5 million plastic bottles.
18.	Mounds of garbage at landfill	Where does all of this trash come from?
19.	Home owner	Homes,
20.	Schools	schools,
21.	Stores	retail stores,
22.	Hospital trash	hospitals,
23.	Kids eating fast food	fast food and other restaurants,
24.	Inside grocery store	and grocery stores.
25.	Office shot	Every part of our community generates trash.
26.	People holding garbage bags.	Each day residents create approximately 3 to 4 pounds of trash per person.
27.	Family with trash (1 yr. worth)	Each household generates 2 to 3 tons of waste per year.
28.	Person peering into garbage can.	If we looked into the nation's garbage can, what would we find?
29.	Picture of paper (42.1 percent imposed)	Paper and paperboard,
30.	Food and yard waste (23.4 percent imposed)	food and yard waste,
31.	Glass (9.4 percent imposed)	glass,

SLIDE #	PICTURE	SCRIPT
32.	Picture of aluminum and steel cans (9.2 percent imposed)	metal,
33.	Plastics (6.5 percent imposed)	plastics,
34.	Other (9.4 percent)	and a combination of other items.
35.	Nation's garbage can	(MUSIC) "Garbage Blues" Stanza 3
36.	Plate of food	(MUSIC)
37.	Plate of food	(MUSIC)
38.	Trash man with trash truck	Where does all of this garbage go?
39.	Landfill	Over 80 percent of the nation's garbage is buried in landfills, but landfills are filling rapidly and being forced to close.
40.	Barge	Other waste is dumped at sea
41.	Trash washed up on beach	and washes onto our nation's beaches.
42.	Incinerator	Ten percent of our waste is burned
43.	Recycle shot	or recycled.
44.	Disposable diapers	Because of our throw-away approach,
45.	Forest	we are using up valuable natural resources
46.	Landfill	and running out of space to discard our garbage.
47.	Landfill	Not only are landfills filling up, but they are posing a threat to our environment and becoming more expensive to build and operate.

SLIDE #	PICTURE	SCRIPT
48.	Community group in discussion	Communities are looking at different ways to handle their garbage:
49.	Recycling bins	minimizing waste; recycling waste;
50.	Incinerator	turning waste into steam to make electricity in waste-to-energy facilities;
51.	Landfill	and landfilling waste that cannot be used in other ways.
52.	People examining trash	(MUSIC) "Garbage Blues" Stanza 4
53.	People examining trash	(MUSIC)
54.	" "	"
55.	" "	"
56.	" "	"
57.	" "	"
58.	New uses	Recycling allows trash to be used again.
59.	Paper	Paper can be made into other paper;
60.	Glass	glass bottles can be made into new bottles,
61.	Cans	and metal can be made into new cans.
62.	Plastic	Plastic can be made into fiberfill flower pots and plastic park benches.
63.	Water	Recycling protects the environment.
64.	Land and forest	It saves natural resources.

SLIDE #	PICTURE	SCRIPT
65.	Landfill	It saves landfill space.
66.	Incineration	In the waste-to- energy plant, it makes garbage a better and less costly fuel to burn.
67.	Recycling container	(MUSIC) "Garbage Blues"
68.	Recycling container with kids	(MUSIC)
69.	Kids bagging garbage	(MUSIC)
70.	Recycling truck	(MUSIC)
71.	Recycling truck at curb	Recycling is better, but there is no single way to recycle.
72.	Recycling containers	Recycling can take place at drop-off points.
73.	Dixie Village Drop-off	The citizens take their recyclables to a specified location, such as a school, a shopping center, or a church.
74.	Curbside container being carried out	In some communities, citizens place their recyclables in a separate container and take the container to the curb in front of their houses.
75.	Recycling truck picking-up	This is curbside collection. A special garbage truck then comes to their houses and picks up the recyclables.
76.	Buy-back center	At drop-off centers, citizens are paid for the material they recycle.
77.	MRF	Other communities recycle at a materials recovery facility, called a "MRF." MRFs are recycling

SLIDE #	PICTURE	SCRIPT
		factories. The recyclables are mixed with the garbage, brought into the facility, and sorted for recycling.
78.	Action shot in a MRF	
79.	Recycling shots	Many communities offer comprehensive solid waste management programs. They teach recycling methods that can help us save space in our landfills and recover natural resources.
80.	People recycling	Together, we can work to reduce waste.
81.	People recycling	Recycle, it's a better way!
82.	Kids recycling	
83.	Adults recycling	
84.	Credit Slide Extension Logo	
85.	Credit Slide GCCC	
86.	Credit Slide Music, Actors, etc.	
87.	Credit Slide Agricultural Committee	

Lesson 5: Once Is Not Enough

Purpose:

1. To identify what can be recycled from normal household waste.
2. To explain the meaning of a cycle.
3. To explain the differences between renewable and nonrenewable resources.

Time: 30 minutes

What You'll Need:

1. "Clean trash" from the participants' homes (no food scraps)
2. Boxes or bags labeled for separated materials (aluminum, glass, newspaper, other)
3. Aluminum can cycle chart

Before the Meeting:

1. Instruct students to bring "clean trash" from home; emphasize that they are not to bring food scraps.
2. Become familiar with Background Information.
3. Collect materials.
4. Consult the glossary and review the definitions for: *solid waste, cycle, precycle, recycle, renewable, resource, landfill, nonrenewable resource, waste stream.*
5. Make a chart showing aluminum can cycle.

Background Information:

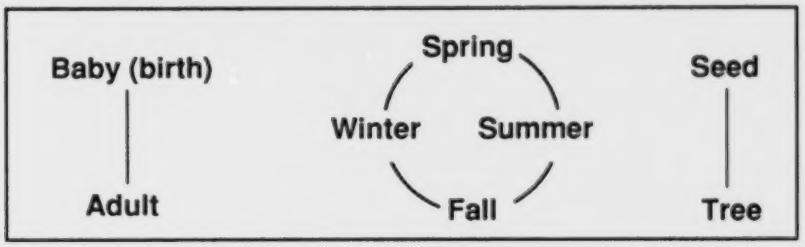
- Each person in the United States generates 3 to 5 pounds of waste per day. Much of this waste is recyclable. Recycling reduces waste and conserves energy and natural resources. By becoming aware of what can be recycled, families can help solve our solid waste problem.

- Thirty percent of everything we throw away is paper. Fifteen percent of that is newspaper. One issue of the Sunday *New York Times* uses 65,000 trees. Each ton of recycled newspaper saves 17 trees. Making paper from recycled material takes 40 percent less energy than making it from raw materials. Some paper items we throw away are cereal boxes (open one: if the inside is gray, it was probably made from recycled newspaper), newspapers, magazines, and so on.

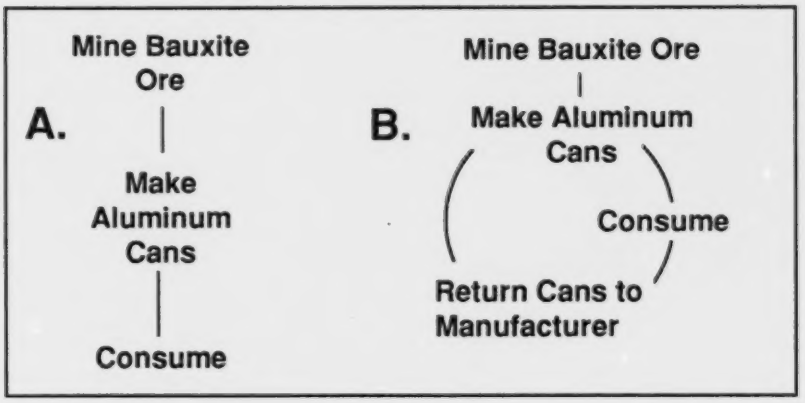
- Ten percent of everything we throw away is glass. Glass is 100 percent recyclable. It is separated by color (brown, green, clear) and crushed into small pieces called cullets.

- Ten percent of everything we throw away is metal. Approximately 50 percent of all aluminum cans are presently being recycled. It takes 96 percent less energy to make cans from recycled aluminum than from raw materials. Four tons of ore are needed to make a ton of aluminum.

- Cycles are an important part of life on earth. Consider the following examples.



Once any step in a cycle is disrupted, the cycle is changed or broken.



Lead-in: Part of "B" is a true cycle; "A" is not. What is the last stage in "A"? (lost in the landfill) The true cycle in "B" is called recycling. It saves both nonrenewable resources and energy.

Have you ever thought about reusing your garbage? That might not sound very appealing, but more and more people are doing it. Instead of throwing newspaper, aluminum cans, and glass into the waste stream, people are taking them to recycling centers. Recycling saves energy and natural resources.

Procedure:

1. Discuss the following terms: *solid waste, cycle, precycle, recycle, renewable resource, nonrenewable resource, waste stream.*

2. Have students separate their trash into boxes labeled as follows:
   a. aluminum
   b. glass
   c. newspaper
   d. other

3. Evaluate how much trash is left after you have removed the recyclables; compare the box marked "other" with the total amount of trash.

Let's Talk About It:

1. What is a cycle?
2. What does *recycling* mean?
3. How can recycling help with the problem of too much trash and too little landfill space? (The landfill will last much longer if we recycle; less energy and fewer natural resources will be used.)
4. Does anyone know what a renewable resource is? (Examples are wind, sun, trees.)
5. What is a nonrenewable resource? (Examples include ores and petroleum products, both of which take ages to be formed.)
6. How can you and your family make a difference in conserving natural resources and energy?

Where to From Here?

A. How to Set Up a Home Recycling Center

1. Find a convenient place in your home or apartment. You don't need much room; a month's worth of glass, cans, and newspaper will usually fit in a 3-square-foot area. The garage, a storage closet, a corner in the kitchen, and under the sink are good places.
2. Find sturdy containers to store materials. Three plastic buckets or paper boxes can be used: one for paper, one for cans, and one for glass.
3. Locate a recycler near you and find out:
   a. if the recycling center is a donation or a buy-back center.
   b. what materials the center will take.
   c. how you should prepare the recyclables before you bring them in.

B. How to Recycle Glass

As much as possible, buy returnable or reusable bottles. To prepare glass for recycling, do the following:

1. Wash the glass; you do not need to remove labels.
2. Separate glass containers by color, either at home or at the recycling center.

C. How to Recycle Paper

1. *Newsprint:* Stack newspapers in a fire-safe area and check with the recycler to see if the newspapers should be tied in bundles.
2. *Corrugated cardboard* (two layers of heavy cardboard with a ribbed section in between): Check with your recycler. Flatten for easy storage and transportation. Store in fire-safe area.
3. *Higher grades:* If you have computer paper, tab cards, and ledger paper, check to see what types your recycler accepts.

D. How to Recycle Aluminum

1. Check to make certain the cans are all aluminum: Use a magnet; aluminum will not stick to it.
2. Rinse. Flattening the cans will save storage and transportation.
3. Separate aluminum cans from such aluminum products as dinner trays, foil, and so on.

Lesson 6: Recycling Makes "Cents"

Purpose:

1. To help students realize that recycling can be profitable.
2. To make students aware of the markets for recyclable materials.
3. To make students aware of recycling centers in the community.

Time: 45 minutes

What You'll Need:

1. Each child should bring newspapers and empty aluminum cans.
2. The teacher should bring 1 pound each of clear, green, and brown glass.
3. Bathroom scale
4. Paper, pencil, chalkboard, or overhead projector
5. Duplicate of enclosed worksheet for each participant
6. A magnet
7. Five garbage bags
8. Copies of Math Problems

Before the Meeting:

1. Review local information on recycling centers and speakers.
2. Call the county office of the Agricultural Extension Service to obtain the name of groups that have information on local recycling centers, pickup boxes, and the prices of recyclables.
3. Call recycling centers for information on their development, purpose, and ownership. (Are they privately operated or run by a co-op or local government?)
4. Obtain a local speaker, if possible, to discuss recycling. (What things can be taken to these centers? What happens to the collected items? What profit can be made by the person turning these items in?) Be sure to select a person who can speak about aluminum, glass, and newspaper.
5. Make copies or make transparencies of Math Problems.
6. Familarize yourself with the words *cullet*, *aluminum recycling*, *glass recycling*.

Background Information:

- The teacher needs to know which materials can be sold or remarketed. (aluminum and glass) Steel cans are also recyclable but they are valued at only 1–3 cents per pound. To determine whether cans are steel or

aluminum look for the recycling logo or use a magnet.

- The teacher needs to understand what will be done with these materials once they are sold. The lesson "Once Is Not Enough" will assist you.

Lead-in: What would you think if I passed the garbage can around and asked each of you to throw money in? Did you know that you throw money away every time you put drink cans in the trash? What do you do with all your newspapers? If the garbage man carries them off, he's carrying off your money. Mr. _____of our local recycling center is here today to tell us why our cans, paper, and glass are worth money. Listen carefully and let's learn how we could make money and help our environment at the same time.

Procedure:

1. Introduce the speaker.
2. Compare value of newspaper and aluminum at recycling centers by weighing 5 pounds of newspaper, 2 pounds of aluminum, and 2 pounds of glass.
3. Have a student stand on the bathroom scales with a garbage bag (record the weight) and add the amount of each material necessary to obtain the amount needed.
4. Explain that recycling centers pay for paper, glass, and aluminum by the pound.
5. Remind students that the speaker told them the value of a pound of each. Use the enclosed math problems and have students determine which material is worth more. The enclosed math problems assume aluminum is more valuable per pound. This value will vary with location and volume.

Let's Talk About It:

1. Do you think recycling is profitable?
2. Who might want your trash?
4. How many of you are now going to try recycling as a way of making money?

Where to From Here? The class can decide if they want to start a collection project to buy something like trees, shrubs, or equipment for their school. You might want to create groups to promote competition. You could also get the PTA involved and begin a school project.

Math Problems

1. If newspaper is $0.05 per pound, how much money will you get for 2 pounds?

2. If glass is $0.01 for 2 pounds, how much money will you get for the following:

   2 pounds
   20 pounds
   40 pounds
   50 pounds
   100 pounds

3. Clear glass is $0.02 per pound, colored glass is $0.01 per pound, and mixed glass is $0.01 for 2 pounds. How much more could you earn if 100 pounds of mixed glass was separated into 50 pounds of clear and 50 pounds of colored glass?

4. If 100 pounds of newspaper is worth $0.25, how many pounds is worth $1.00?

5. If aluminum is $0.30 per pound, how much money will you get for 2 pounds?

6. If aluminum is $0.70 for 2 pounds, how much money will you get for the following?

   2 pounds
   20 pounds
   40 pounds
   50 pounds
   100 pounds

7. Which recyclable material is worth more: newspaper, aluminum, or glass?

Lesson 7: The Name Game

Purpose:
1. To increase student and public awareness of recycling.
2. To create a recycling logo/slogan.

Time: 45 minutes

What You'll Need:
1. Construction paper
2. Crayons
3. Colored chalk
4. Scissors
5. Glue
6. Felt-tip markers
7. Pencils
8. Paper
9. Magazines
10. Newspapers
11. Soda cans
12. Sample of logo
13. Picture of school mascot

Before The Meeting:
1. Consult the glossary and review the definitions of *logo, slogan, recycle*.
2. Teacher may wish to provide some additional logos or slogans the students would recognize.

Lead-in: Whenever you see this logo (show sample of a logo) what do you think of? Whenever you see this picture (hold up picture of school mascot) what do you think about? Today we are going to talk about recycling, and we will make up our own logos and slogans.

Procedure:
1. Discuss the value of logos and visual aids in learning and getting people's attention.
2. Have students cut logos and slogans from magazines and newspapers for bulletin boards. Take only a few minutes. Emphasize that logos help us to identify a product at a glance.
3. Divide the class into groups of three or four students.
4. Let students choose what materials they want to use for their own logo or slogan.
5. Have students create their own logos.
6. Display all logos and slogans in the classroom, the community, or such public buildings as the library or the Agricultural Extension Service building.

Let's Talk About It:
1. What good are recycling slogans and logos?

2. What happens to newspapers and cans if they are not recycled? (They are thrown away and wasted.)

Where to From Here?

1. See if the local media will feature your class's (or classes') recycling logo and slogan activity.

2. Have students look at magazines, newspapers, billboards, or products for advertisements that promote recycling.

Logos And Slogans

Complete or identify the slogan: Ask the students to fill in the underlined words.

Give a hoot! _____ _____.

Leave the driving to us.

_____
(Product Name)

Fly the friendly skies of _____.

We do _____ right.

_____
(Product Name)

Double your _____. Double

your_____.

_____
(Product Name)

You deserve a break today at _____.

Let your _____ do the walking.

_____
(Product Name)

Lesson 8: Recycled Art

Purpose:

1. To have students recycle solid waste by turning it into art.
2. To allow students to use their imaginations to create a collage from trash.

Time: 45–50 minutes

What You'll Need:

1. Scissors
2. Glue
3. Poster board or cardboard pieces
4. Various items typically found in classroom: Styrofoam cups, paper, pieces of plastic wrappers, and straws
5. Trash bags
6. Several examples of collages

Before the Meeting:

1. Distribute trash bags to student.
2. Ask students to collect "clean" trash at desk (Styrofoam cups, newspapers, straws, plastic wrappers).
3. Collect other materials needed for the lesson.
4. Familiarize yourself with terms *reuse* and *collage* (see glossary).
5. Make collages for students to see. Have one abstract collage and one that depicts a scene or an object. Students can make individual collages on construction paper or group collages on poster board.

Lead-in: How many of you enjoy making things? What is the most expensive part of making an art object? If you said "materials," you are right. Today we are going to make a collage from materials that normally would be thrown away.

Procedure:

1. Explain what a collage is.
2. Show examples of collages.
3. Distribute construction paper or poster board, scissors, and glue.
4. Explain that they can break or cut their materials into small pieces and then glue them to their paper to create the look they want.
5. Encourage students to be creative and not just copy examples or each other.

Let's Talk About It:

1. What kinds of trash are good for making art objects?
2. What items would you not use?
3. What advantages are there to reusing trash? (less expense; supplies readily available)

Where to From Here? Make sculpture from papier-mache or other "trash."

Lesson 9: It's A Rotten Idea

Purpose:

1. To help students understand the concept and goal of composting.
2. To help students understand how to build a compost pile.

Time: 45 minutes

What You'll Need:

1. Chicken wire (18 feet by 4 feet)
2. Four T-poles
3. Hammer (to put poles in the ground)
4. Leaves and grass clippings
5. Soil
6. Food scraps from cafeteria (optional)
7. 1 cup of lime
8. 1 cup of fertilizer
9. Shovel
10. A composting site
11. Poster paper (3 feet by 4 feet)
12. Markers

Before the Meeting:

1. Read background information and become familiar with the definitions of *composting, solid waste, biodegradable, bacteria, recycle, aerobic.*
2. Prepare a picture of a trash can using poster paper and place it in a conspicuous place in the classroom.

Background Information:

- The word *recycling* brings to mind stacks of newspapers, bags of aluminum cans, or cartons of glass. But an additional 30 percent of our household garbage can also be recycled.

- Each year thousands of tons of leaves, grass clippings, and other vegetable matter are burned, thrown away, or otherwise destroyed and wasted by home owners. Thousands of the dollars spent on fertilizers could be saved if more of this organic matter were used on the home grounds. It would also make the soil loamier, improve its water-holding capacity, and supply some of the foods necessary for normal plant growth.

- Compost consists of leaves, straw, grass clippings, or other plant matter, plus lime and fertilizer, all completely intermingled and decomposed. The materials most suitable for compost are new-fallen leaves, grass clippings, straw, cut flowers, vegetables, and refuse from

the garden after a frost.

- Good compost must be thoroughly mixed and allowed to decompose. By adding certain fertilizer materials, you speed up the decaying process considerably at the same time that you enrich the compost. A good commercial fertilizer and some ground limestone are generally used. Decomposition is the biochemical process by which bacteria, fungi, and other microscopic organisms break organic wastes into nutrients useful to plants and animals. Decomposition occurs whenever a leaf falls to the ground or an animal dies. It is essential for the continuation of life on Earth. The result of decomposition in a compost pile is a nutrient-rich humus that is excellent for improving soil quality and plant growth.

- Compost is used as top dressing on lawns. Begin by spreading about 1/2 inch over the entire area. A good mixture in which to plant seeds or pot plants may be made by thoroughly mixing equal parts of compost, sand, and garden soil. It may be worked into flower borders and is especially good for perennials. Compost also makes an excellent mulch for all kinds of shrubs and is excellent in the vegetable garden.

- Composted soils are often made by putting a 2-inch layer of garden soil over each 12 inches of organic matter. The soil tends to keep the leaves from blowing away. Thoroughly mix the organic matter, and you will have a rich planting soil.

Lead-in: The next time your parents tell you to clean off the dinner table, save your food scraps and put them with grass clippings. This is the way we make compost! Today we are going to talk about composting and why it is important.

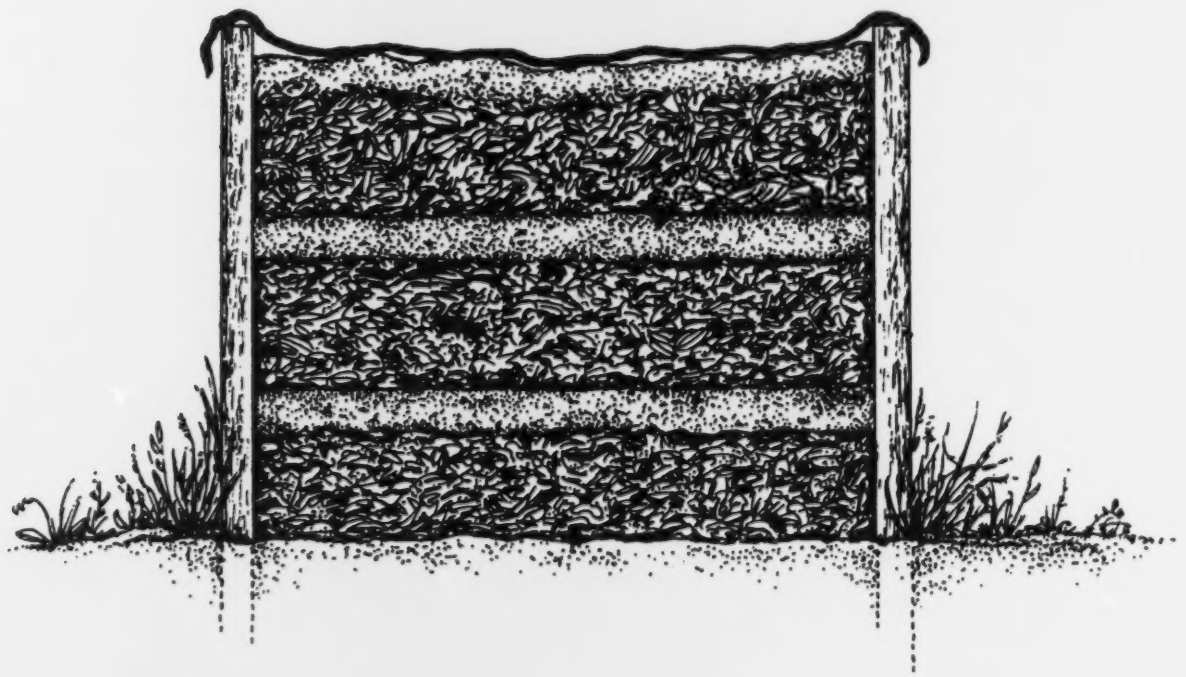
Procedure:

1. Define and discuss composting. Discuss the importance of bacteria in the soil, particularly the role they play in decomposing organic wastes.
2. Take students to the composting site.
3. Supervise students as they build the compost pile, explaining the reasons for each step.

4. Hammer in the T-poles and hang the wire.
5. At level one, add 12 inches of leaves, grass and other organic waste.
6. Add 1 cup each of fertilizer and lime to each layer.
7. Wet down leaves, fertilizer, and lime.
8. Add 2 inches of soil on top of leaves.
9. Repeat steps 1-5.
10. Every other day for 2 weeks, have a few students turn the material (with spades) to speed up decomposition. A thermometer could also be used to monitor compost temperature. Turning of the compost would occur when the temperature decreases.

Let's Talk About It:

1. What is happening to the organic waste? Why?
2. Imagine a world where decomposition didn't take place. What would it be like?
3. What are some benefits of composting household organic wastes? (We save on plastic disposal bags, landfill space, and transportation costs. We create nutrient-rich humus.)



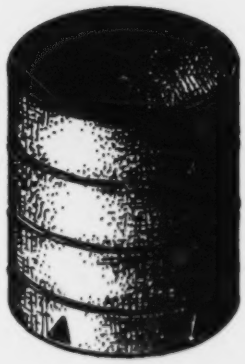
Lesson 10: 2-4-6-8 Why Do We Incinerate?

Purpose:

1. To understand that incineration reduces the volume of garbage.
2. To recognize that a waste-to-energy facility will prolong the life of a landfill.
3. To demonstrate that some garbage contains energy.

Time: 30–45 minutes

What You'll Need:



1. Two number 10 metal cans from the cafeteria; use a punch-type can opener to make holes around the bottom of the can (see diagram).
2. Matches
3. Ten pieces of used notebook paper, loosely wadded to fill the cans
4. A fire extinguisher or a bucket of water
5. Two aluminum soft drink cans
6. Two pieces of fine-mesh window screen
7. A yardstick for stirring

Before the Meeting:

1. Become familiar with the lesson plan. You may want to try the experiment ahead of time.
2. Learn the following vocabulary words: *energy, landfill, volume, disposal, waste to energy, resource recovery, incinerate.*
3. Choose an appropriate spot to incinerate solid waste; it should be at least 100 feet from trees, buildings, and shrubs.
4. Check with school/community administrators for burning regulations.
5. Be aware of safety precautions.
6. Using tape or rope mark a circle 8–10 feet in diameter around the metal can to ensure student safety.

Background Information:

- By burning certain garbage, you reduce its volume and conserve space in the landfills.
- Energy shows up in many forms, such as heat, light, and movement. Energy can be stored, and it can change from one form to another.
- In this experiment, chemical energy stored in the waste

paper is converted to heat, light, and air movement. The energy was originally stored in a tree through the process of photosynthesis.

- During the process of incineration, various organic chemicals and heavy metals may be emitted or concentrated in the ash. Devices are available to monitor emissions and curtail incineration if air quality criteria and standards are not met.

Lead-in: Why would we want to burn garbage? Let's do a scientific experiment to find out. We will each need to observe carefully what happens when we burn waste from our classroom.

Procedure:

1. Take the children to the predetermined outdoor site for the experiment. Give safety instructions, noting the "safe zone" where students may stand to observe the experiment.
2. Instruct the children to observe and remember what they see, feel, smell, and hear.
3. Have one child put five loosely wadded pieces of waste paper and an aluminum drink can into the metal can.
4. Light the trash in the can, place wire mesh on top of can, and step into "safe zone" to observe.
5. Ask the following questions during the experiment:
   a. What's happening inside the can?
   b. Can you observe at least three things coming out of the can (heat, light, smoke)? Remind students that this is an adult-supervised experiment, not one they should try alone.
6. After the flame subsides, allow a few moments for the smoke to clear.
7. Using the yardstick, stir the remains. Explain that in an actual waste-to-energy facility, garbage is often rotated in a drum as it burns so that the waste settles.
8. Have the children come to the site in groups of three to complete their observation.
9. Once the can has cooled, take it inside and place it in the classroom for a couple of days to enforce the concept and encourage further thinking.

Let's Talk About It:

1. What happened to the paper?
2. What happened to the aluminum can?
3. Is there any waste remaining?
4. How did it change form?
5. Was anything harmful produced by this burning? (dioxin and carbon monoxide)
6. Is incineration a good or bad way to handle our solid waste? What are some advantages? (reduces volume and produces energy) And disadvantages? (expensive and difficult to dispose of ash)
7. How might we have handled the can, which didn't burn? (recycle)
8. What do you think would have happened if we had added glass, rubber, white cloth, and food scraps? (In all cases carbon monoxide and particulate matter, which can escape, would be produced.)

Where to From Here?

1. Visit a waste-to-energy facility, if available.
2. Invite a resource person to discuss waste-to-energy facilities. You could get a county manager, a county engineer, a Keep American Beautiful representative, an engineer, or a solid waste officer.
3. Build a model of a waste-to-energy facility.
4. To investigate the role that air (oxygen) plays in incineration, repeat the experiment using a second number 10 metal can; this time, however, do not punch any holes in it. You might also reuse the first can with various amounts of paper to investigate the most efficient combination of air and fuel (paper) for complete combustion.

A Waste-To-Energy Problem

Every year, each of us is responsible for about 1 ton of garbage. One person's yearly garbage fills about 27 large garbage cans.

When 1 ton of garbage is incinerated in a waste-to-energy facility, we recover 500 kilowatt hours of energy. Electricity costs 7 cents per kilowatt hour. The energy contained in 1 ton of garbage is worth how much? _____.

This is enough energy to light a lamp for 5,000 hours. How many days can you light your lamp with the energy that can be recovered from the ton of garbage you will generate this year? _____.

Lesson 11: Who Hid Energy In The Garbage?

Purpose: To investigate energy transfer in order to better understand the waste-to-energy transformation.

Time: 35–45 minutes

Materials: Three 8 1/2-by-11 signs inscribed as follows: "Who Hid Energy in the Garbage," "Garbage With Hidden Energy," "Garbage Without Hidden Energy."

Before the Meeting:

1. Have an assortment of garbage ready; have one piece for each student. (Refer to the chart for the garbage you will need.)
2. Review the Background Information section.
3. Prepare the signs and place them in the room where the garbage can be sorted.
4. Familiarize yourself with the definitions of *energy*, *transfer,* and *photosynthesis* (see glossary).

Background Information:

- Energy can occur in many forms: heat, light, or movement; it can also be stored. Energy can change from one form to another.
- Almost all of our energy originally came from the sun. (Some of our nuclear energy may have another source; nuclear energy is not covered in this lesson.)
- Energy from the sun is captured and stored by green plants in a process called *photosynthesis*. Energy stored in fossil fuels (coal, oil, gas) was captured millions of years ago by plants and animals.
- Some garbage releases energy when burned; other garbage does not contain stored energy.
- The Energy Flow Chart will help you and your students discover the hidden treasure in garbage: energy.

Lead-in: Who hid the energy in the garbage? Garbage is full of hidden treasures, one of which is energy. Other treasures are those pieces of garbage that can be used or recycled. Where does the energy come from? Objects made from plants (or from animals that ate plants) contain energy. Objects made from nonliving materials do not contain energy.

The garbage containing energy is valuable. We can burn that garbage to release the energy. We can use that energy in our homes, schools, or industries. Let's be detectives and discover what kinds of garbage contain energy.

Procedure:

1. Introduce vocabulary and Background Information.
2. Let students take turns showing examples of garbage.
3. Encourage students to decide if the materials are of living (plant or animal) or nonliving (mineral) origin.
4. Sort the garbage into two piles: garbage with "hidden energy" (from plant or animal origin); garbage without "hidden energy" (mineral origin).
5. Create a table-top or bulletin-board display using the signs and materials sorted in number 4. Place the display in your classroom, library, or other highly visible area.
6. Have children draw a diagram showing the energy flow, beginning with the sun and ending with their piece of garbage (see Energy Flow Chart).

Let's Talk About It:

1. What hid energy in the garbage? (the sun)
2. How can we get energy from the garbage so that we can use it? (burn the garbage in a waste-to-energy facility)
3. Why should we recycle garbage? (to save energy and natural resources)

Where to From Here?

1. Create a bulletin board from the waste-to-energy exhibit and include the following:
   a. real objects
   b. magazine pictures
   c. students' drawings of their garbage
2. Make an energy-flow mural.
3. List the items in the classroom that need energy: students, lights, clocks, audio-visual equipment, heat, plants, and so on.

Energy Flow Chart

WASTE MATERIALS	STORE ENERGY?	ENERGY FLOW
paper	yes	sun---tree---paper
aluminum & other metals	no	
plastic	yes	sun---ancient plants and animals---oil---plastic
glass	no	
wood	yes	sun---tree---wood
cloth	yes	sun---plant---cotton/linen sun---food plant---animal---wool/silk sun---ancient plant/animal---fossil fuel---synthetic fiber
leather	yes	sun---food plant---animal---leather
fruits & vegetables	yes	sun---food plant

Lesson 12: Tale Of The Trashmores

Purpose:

1. To show how a waste-to-energy facility recovers energy.
2. To recognize how the facility protects the natural environment.

Time: 45 minutes

What You'll Need:

1. Script for skit
2. Signs made from construction paper and labeled as follows:
   - LANDFILL
   - LANDFILL—GETTING FULL
   - HOUSE
   - RECYCLING CENTER
   - ALUMINUM
   - GLASS
   - PAPER
   - WASTE-TO-ENERGY PLANT
   - SCRUBBER
   - ENGINEER #1
   - ENGINEER #2
   - E, L, E, C, T, R, I, C, I, T, Y
3. Props for skit:
   - One large bag of garbage
   - One medium bag of burnable garbage
   - Newspapers
   - Jelly jar
   - Soft drink can
   - One small plastic bag of ash
   - Microwave food containers
   - Fast food bags and containers
   - Plastic milk container
   - Pizza box

Before the Meeting:

1. Read Background Information and skit.
2. Prepare signs.
3. Gather props.
4. Assign the characters as follows:
   - Tom Trashmore (father)
   - Trudy Trashmore (mother)
   - Trixie Trashmore (teenager)
   - Tyrone Trashmore (5th grader)
   - Ted Trashmore (grandfather)
   - Landfill
   - 11 letters (E, L, E, C, T, R, I, C, I, T, Y)
   - Recycling Center

- Glass
- Aluminum
- Newspaper
- Two engineers (to transport garbage and recyclables)
- Waste-to-Energy Plant

5. Become familiar with the terms *waste-to-energy, recycle, disposal ash, incineration*, and *municipal solid waste* (see glossary).

Background Information:

- The waste-to-energy facility takes garbage to be incinerated. The byproducts of incineration are ash, glass, metal, and energy.
- The facility is not an alternative to a landfill but a method to reduce the volume of waste as well as to produce energy.
- The waste-to-energy facility conserves natural resources and provides an alternative energy source.

Lead-in: Today we are going to observe how one family, the Trashmores, faces the issue of solid waste disposal. You may see similarities to your own families. What will we do when the landfills are full? What can our families do to help with the situation? (Allow time for response to questions.)

Procedure:

1. Discuss the vocabulary terms before the meeting.
2. Distribute and discuss student worksheet 12.1.
3. Assign the character roles.
4. Have children arrange the props.
5. Have the narrator begin the play; be sure to choose a strong reader.
6. Present the play.
7. Pass out and have students complete student worksheets 12.2 and 12.3.

Let's Talk About It: Promote discussion relating to the skit.

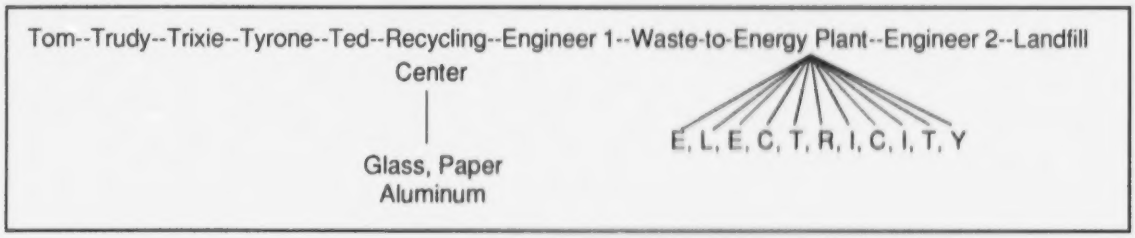
1. How are we like the Trashmores in dealing with our solid waste?
2. How can we reduce the amount of waste we send to the landfill? (recycle, use less disposable packaging)
3. What are the advantages of a waste-to-energy facility? (It saves landfill space and reduces trash volume.)

4. Disadvantages? (cost, possibility of breakdown)
5. How does a waste-to-energy facility save natural resources? (It saves landfill space and produces energy.)

Instructions: **Tale Of The Trashmores**

This skit requires that one person be the narrator: the leader, the teacher, or a youth participant. Participants are to act out their assigned parts. They should read the script before the skit begins. The teacher may also want to read the story to the class before beginning.

Staging: Stage the characters from left to right:



Narrator: Once upon a time in a community much like ours, there lived a careless family, the Trashmores:

Father: Tom Trashmore
Mother: Trudy Trashmore
Daughter: Trixie Trashmore, a teenager
Son: Tyrone Trashmore, age 11
Grandpa: Ted Trashmore

The Trashmore family did all the things that most families do. They ate microwave-cooked food. They munched junk food while watching TV. They had Dad pick up meals at fast food restaurants on the way home. They fussed over who should take out the garbage. And they didn't pay much attention to the amount of garbage they threw away. *(One Trashmore hands large bag of trash to landfill.)*

The landfill in the town where the Trashmores lived was filling up rapidly. In fact, it was almost full! Tom Trashmore continued to throw away his newspapers. Trudy continued to throw away her microwave containers, milk jugs, and jelly jars. Trixie didn't pay any attention to all her pizza boxes, and Grandpa Ted thought nothing of tossing his soft drink cans in the garbage.

But clever Tyrone began to investigate his family's trash after a school field trip to the landfill. His teacher and the county landfill officials talked about the nation's waste problem, so Tyrone started to think and worry.

Tyrone: Isn't there a better way to handle our trash?

Grandpa Ted: When I was a boy, we just burned our garbage in a barrel in the backyard.

Tyrone: Yes, but that polluted the air, and we can't do that with the whole county's garbage.

Narrator: Time passed, and the landfill was reaching capacity. It would soon close unless things changed, and no more landfill space was available.

Then some very thoughtful and smart community leaders developed a plan for a waste-to-energy plant *(children get into a huddle and whisper softly)* that would safely burn garbage and produce energy.

The plant worked like this: Garbage would be separated and recycled so that glass *(Trudy T's jelly jars)*, aluminum *(Grandpa Ted T's soft drink cans)*, and paper *(Tom T's newspapers and Trixie T's pizza boxes)* were taken out. That would reduce the amount of garbage the Trashmore family sent to the landfill. The recyclables would go to the recycling center. The rest of the garbage was valuable too. It was sent to the waste-to-energy plant. There the garbage was burned at extremely high temperatures. The leftovers were ash, glass, and metals. Scrubbers worked in the waste-to-energy facility to get rid of pollutants and to help clean the air that went outside. And plenty of extra energy was produced. The energy released from the burned garbage provided electricity to the Trashmores' home and neighborhood. That made everyone happy.

All: Hurrah!

Narrator: Tom T was happy because the power bill was cheaper. Trudy T was happy because there was plenty of energy to cook her favorite recipe of blackberry jelly. Trixie T was happy to continue listening to her CD player. Grandpa Ted was happy because the recycled aluminum soft drink cans gave him extra pocket change. Tyrone was the happiest of all because now he didn't mind carrying out the trash. He knew that the landfill wasn't going to close. And the whole town was happy because just a tiny bit of the waste product had to go to the landfill.

Waste-to-energy plant: *(Hands tiny bag to Landfill.)* Whew.

Narrator: The waste-to-energy plant was a beautiful building that the citizens bragged about. They invited people from all around to come see their wonderful addition.

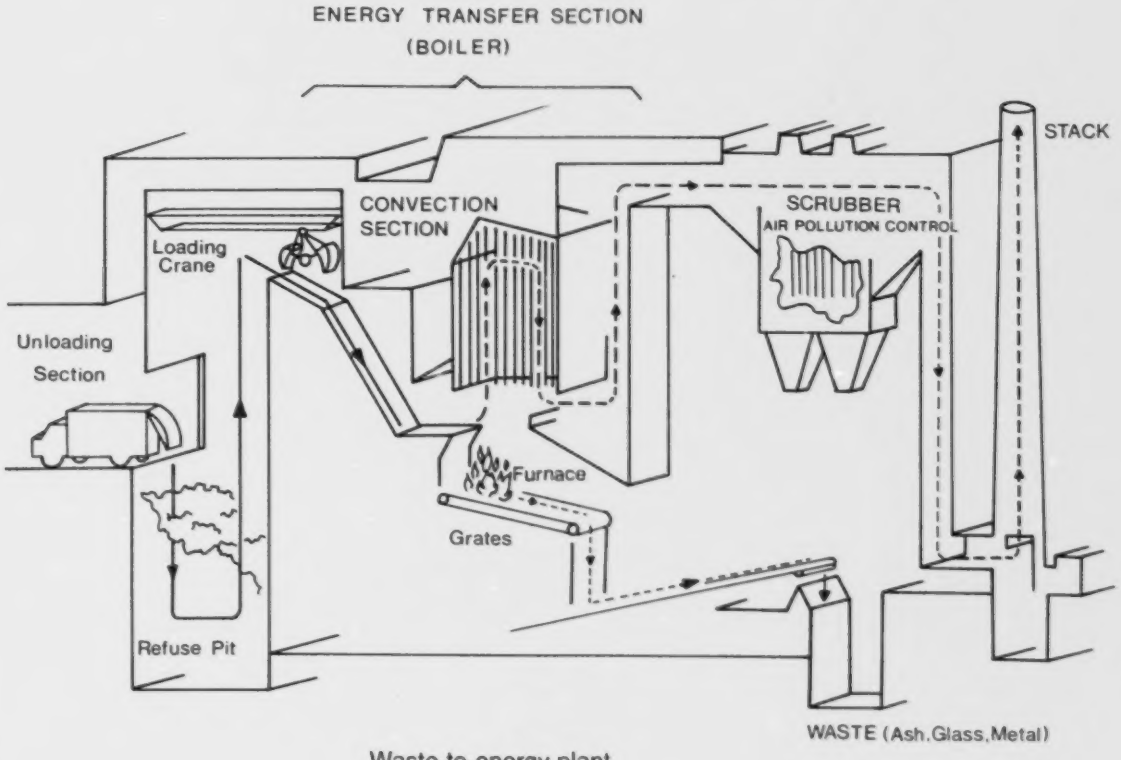
The Trashmores still had a dilemma. They were dissatisfied with their name because they were no longer trashy. After much deliberation, they changed their name to the Trash-no-mores, and they set an example for the entire community.

Landfill: Hip, hip. . .

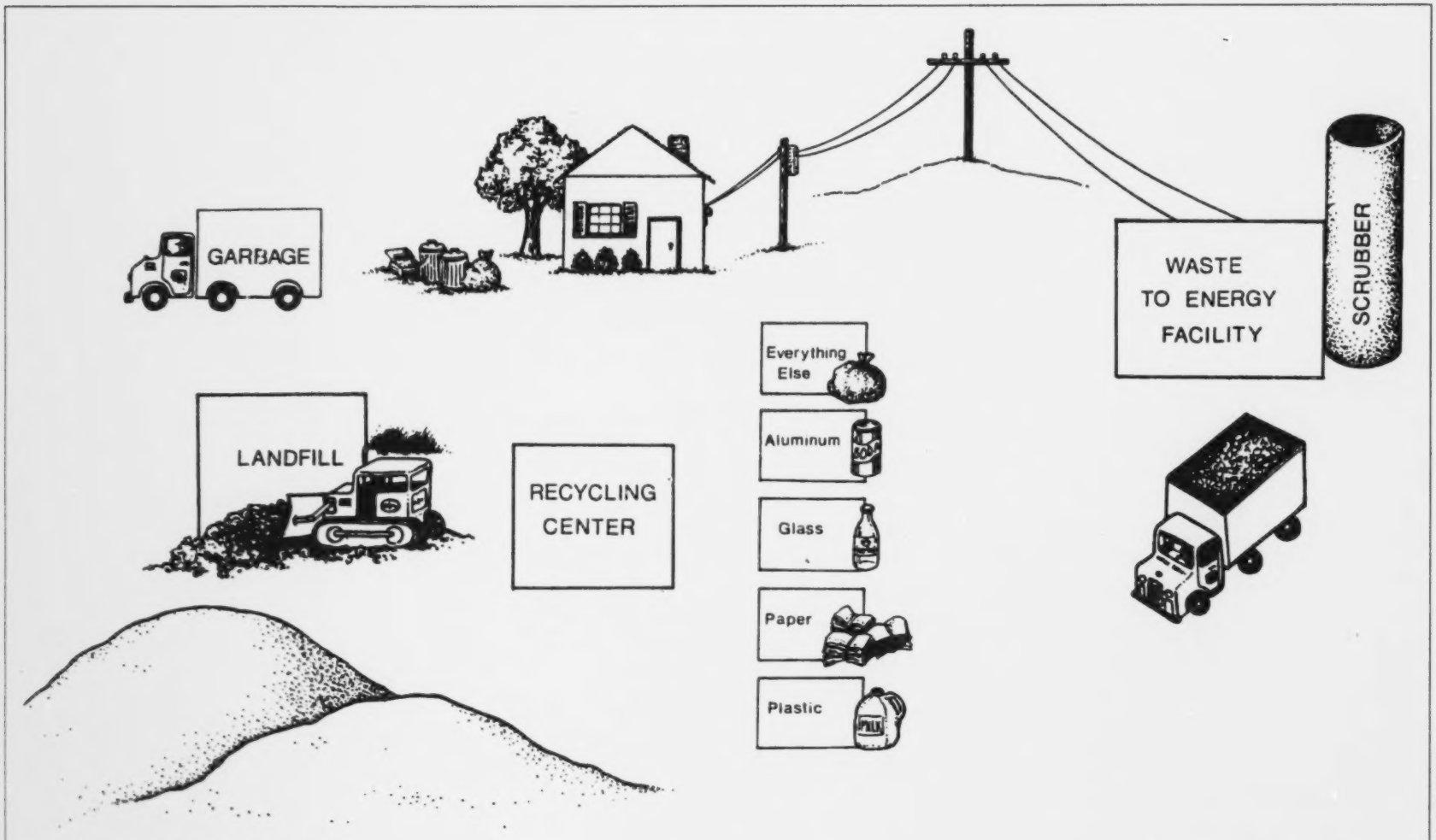
All: Horray!

Turning Garbage To Energy In A Waste-To-Energy Facility

1. Garbage trucks dump unsorted garbage into an indoor receiving pit.
2. Overhead cranes lift the trash and feed it into the furnace through a hopper.
3. Inside the furnace, moving grate bars mix the garbage to feed in air and ensure complete burning at 1,800 degrees.
4. A vibrating feeder sifts out ashes. The ash removed from the facility represents a 90 percent decrease of the original volume.
5. Heat generates super-heated steam, which turns a turbine generator and produces electricity.
6. Scrubber removes smoke and dust particles from the emissions.
7. A smokestack emits what are ideally invisible and odorless gases to the atmosphere.

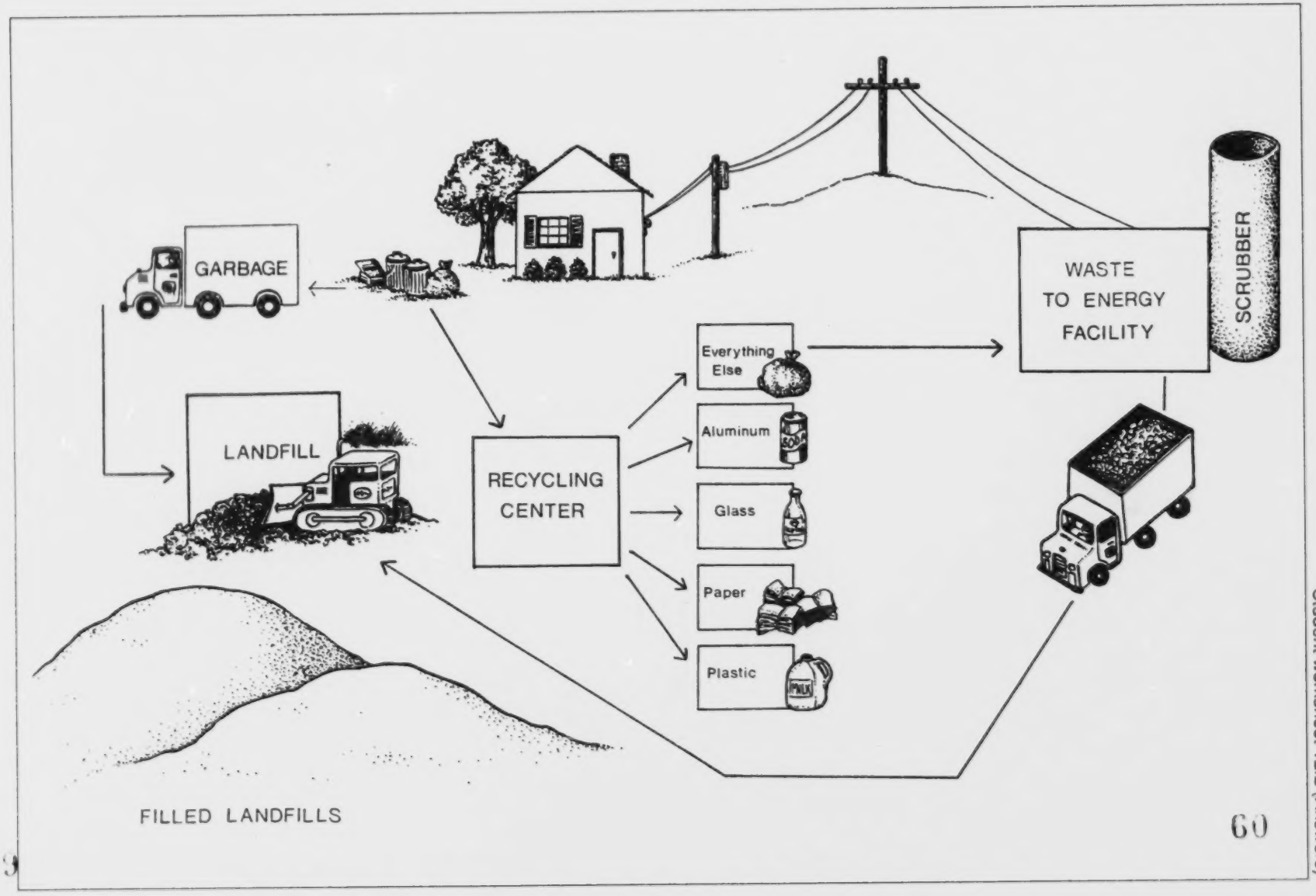


Waste-to-energy plant

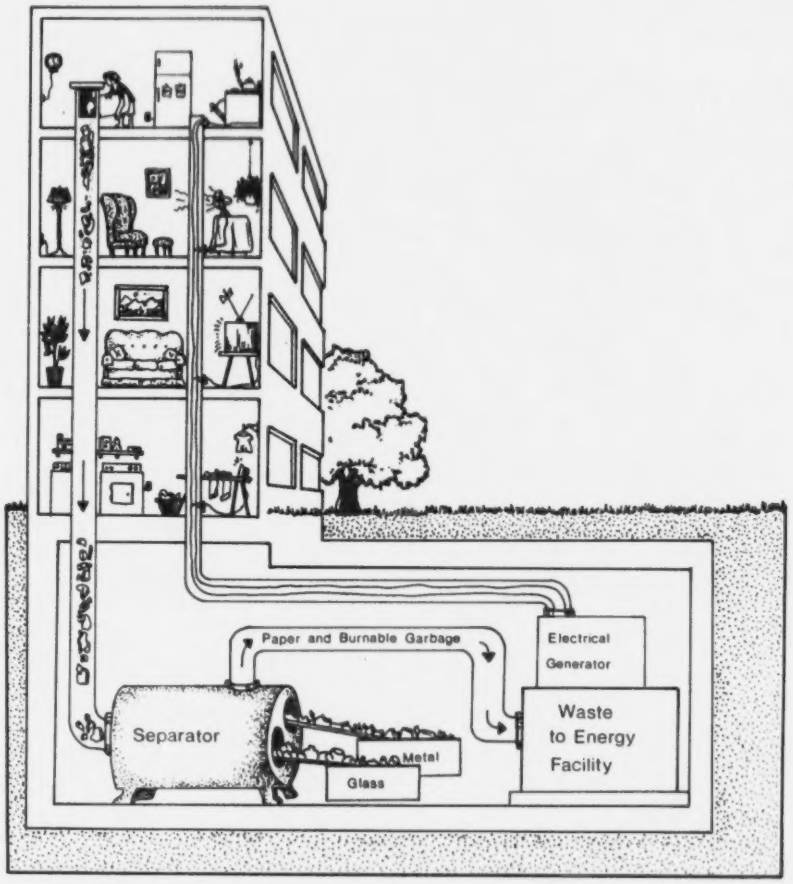


FILLED LANDFILLS

Look at the picture above. By drawing arrows, show where the solid waste goes once it leaves the Trashmores' house. How can energy be returned to the house for use by the Trashmores?


GARBAGE
LANDFILL
RECYCLING CENTER
Everything Else
Aluminum
Glass
Paper
Plastic
WASTE TO ENERGY FACILITY
SCRUBBER
FILLED LANDFILLS

How The Trashmores' Solid Waste Became Energy



Now draw a picture of how your family's solid waste is managed once it leaves your home.

Lesson 13: Trashbusters

Purpose:

1. To learn that landfills are necessary for the disposal of solid waste.
2. To understand the contents of landfills.
3. To understand that landfilling is a scientific operation.
4. To understand what happens to solid waste once it leaves the home.

Time: 45 minutes

What You'll Need:

1. Videotape: *Trashbusters* (available from your county office of the Agricultural Extension Service)
2. Videocassette recorder
3. Television

Before the Meeting:

1. Read Background Information.
2. Prepare VCR and TV.
3. Preview video before class time.
4. Familiarize yourself with the terms *landfill, solid waste officer, compacter, EPA, leachate, methane gas, landfill cell, NIMBY, NIMET* (see glossary).

Background Information:

- In 1986, Americans generated enough waste to fill a convoy of 10-ton garbage trucks halfway to the moon. And the convoy is getting longer. At the same time, we are running out of places to dispose of all that waste. The gap between what we produce and what we can safely and efficiently dispose of has become a national problem.

- Currently, more than 80 percent of our garbage goes to landfills. By 1993, more than half of the nation's landfills will be full. At the moment, few new landfills are being built because people are alarmed about the health and environmental problems landfills may cause. This attitude is often called NIMBY (Not In My Back Yard) or NIMET (Not In My Elected Term).

- To understand how landfills work, we must first recognize that they are more than just holes in the ground. They are carefully designed and expensive, and the cost of building them is rising.

- When municipal solid waste is brought to a landfill, it is dumped in a small area called a cell. It is then spread into a thin layer and driven over by the huge steel wheels of the compacters. The waste must be covered with 6 inches of dirt every day to reduce odors and early decomposition, which causes groundwater pollution.

- Landfills can only be built on certain kinds of sites. They are constructed so that water will run off before entering the cells, but some manages to get in anyway. When that happens, leachate is produced; it then seeps through the contents of the landfill, sometimes forming a toxic liquid that must be collected and treated to prevent environmental contamination.

- Some counties also provide green boxes or container sites where individuals can dispose of their own trash.

Lead-in: Where does our solid waste go? A small portion gets reused or recycled. Another small amount can be burned to produce energy. But most of our waste is wasted! It goes to a landfill. Solid waste has been around a long, long time. Only in the modern age has it become a crisis. Can you explain why?

1. More people. More people create more trash.
2. Wealth. In our consumer society, people use more disposable and packaged products. (Discuss fast foods and other sources of these products.)
3. Technology. Modern science and 20th-century mass production create more products for us to turn into waste.
4. Lack of foresight. We often fail to prepare for the future.

Procedure:

1. Introduce the videotape. Tell students that it shows how our solid waste is handled once it leaves our homes.
2. Instruct students to listen for the following vocabulary words and acronyms:

- landfill
- solid waste
- solid waste officer
- compacter
- EPA
- leachate
- methane gas
- landfill cell
- NIMBY
- NIMET

3. Show videotape (15 minutes).

Let's Talk About It:

1. Why do we need landfills?
2. Who is responsible for landfills in our area?
3. Define the vocabulary terms.
4. Why is landfill operation scientific? (Planners must take several factors into consideration, including soil type, and groundwater levels.)

Where to From Here?

1. Do a class survey to find out how each student's waste is collected and disposed of.
2. Build a model of a landfill, showing the weigh station, cell preparation, and layout.

Lesson 14: A Sanitary Landfill Is Not A Dump

Purpose: To understand the design and contents of a landfill.

Time: 45 minutes

What You'll Need:

1. *Percolation experiment:*
   - Three glass jars
   - Creek clay
   - Sand
   - A piece of plastic
   - Water
   - A clock or watch
2. *Landfill in a jar:*
   - 1-gallon glass jar
   - Enough soil to fill half the jar
   - Big spoon
   - Piece of plastic wrap to cover the jar
   - Piece of glass (1-inch square)
   - Rubber band
   - Piece of bread
   - Cigarette butt
   - Apple
   - Lettuce
   - Newspaper
   - Piece of wood
   - Small piece of Styrofoam or plastic
   - Pop top from an aluminum can
   - Small scrap of fabric
   - Tissue
   - Tape to label items placed in the landfill
   - Wall chart on which to note the changes in the trash (attached)
3. Sample of landfill liner material
4. *Where The Sidewalk Ends* by Shel Silverstein

Before the Meeting:

1. Familiarize yourself with these vocabulary words: *landfill, municipal solid waste, leachate, geology, hydrogeology* (see glossary).
2. Read the Background Information.
3. Collect the materials for the activities.
4. Get *Where The Sidewalk Ends*, by Shel Silverstein, from the school library and read "Sarah Cynthia Sylvia Stout."

Background Information:

- Sanitary landfills provide a final resting place for most solid and nonhazardous residential, commercial, and industrial waste. There are 9,300 solid waste landfills operating today; 6,000 of these are municipally owned. According to the United States Conference of Mayors, more than half of the 9,300 landfills will close within 10 years. Currently 75–80 percent of our municipal solid waste goes to landfills. While new technologies are gaining popularity, we will continue to need landfills to dispose of nonrecyclables and ash.

- Prior to the mid-1970s many landfills were basically open dumps, some of which received hazardous waste. In 1976, the Resource Conservation and Recovery Act (RCRA) was passed by Congress to protect human health and the environment from improper waste management practices. RCRA classifies landfills and regulates what types of waste they may receive.

- Site suitability is determined by a number of criteria, including careful analysis of the surface and subsurface geology and hydrogeology, the nature of adjacent environments, the access routes, and the proximity to waste generation sources. Groundwater sources and flow direction must be examined with particular care, along with soil composition and site engineering. Only after a potential site passes stringent legal, environmental, and engineering criteria can elaborate preparation required for a modern sanitary landfill begin.

- The bottom and sides of a landfill are lined with layers of compacted clay, thick plastic, or both, to ensure that any liquid that enters the excavation is retained. Landfill sites are designed so that all rain or snow that falls on the site is retained, collected, and treated before release. A network of drains collects the liquid (leachate) that has percolated through the waste and directs it to recovery points, where it is collected for treatment (see attached drawing).

- In a typical landfill, the area for waste disposal is divided into a series of individual cells. In daily disposal activities, only a small portion of the site (known as the "working face") is used, minimizing exposure to wind and rain. At the conclusion of each day's activities, a layer of earth (know as "daily cover") is spread across the compacted waste to minimize odor

and prevent insect and vermin problems. Daily cover may consist of soil, foam, or sheets of synthetic material. Each cell is filled and capped with a layer of clay and earth; it is then seeded with native grasses according to an approved closure plan.

- A modern landfill can take more than 5 years to proceed from the site selection to the completion of engineering designs, permit applications, and public hearings.

Lead-in: Read "Sarah Cynthia Sylvia Stout Would Not Take the Garbage Out" aloud. Why did all the neighbors move away and Sarah's friends quit coming to play? Sarah's house had become a dump. All the waste was just allowed to pile up. There is a big difference between a dump and the sanitary landfills required by law today.

Procedure: *Percolation experiment*

1. Place a funnel in each of the three glass jars.
2. Line one funnel with plastic, one with clay, and one with sand or sandy soil.

3. Pour equal amounts of water on top of each type of soil and plastic.
4. Time the number of minutes the water takes to seep through the soil into the jars.
5. Compare the colors of the water in the two jars.
6. Measure the water in each jar to determine how much was absorbed by each type of soil.

Procedure: *Landfill in a jar*

1. Cover the bottom of the jar with 2 inches of soil.
2. Alternate layers of trash and soil in the jar, ending with a layer of soil. Arrange the pieces of trash around the edge of the jar so they can be seen. Place the labels on the outside of the jars.

3. Cover the jar with a lid or with plastic wrap and a rubber band.
4. Make a prediction about which trash will change first.
5. Check the jar every week. On the chart make notes about which pieces are changing and which are not.

Let's Talk About It:

1. Why do we need landfills?
2. What happens to the trash buried in the landfill?
3. How does the design of the landfill protect the environment?
4. Discuss sample of landfill liner and "anatomy of a lined landfill" graphic.

Where to From Here?

1. Research the status of your county landfill.
2. Build a landfill on your own and share what you have learned with other groups.

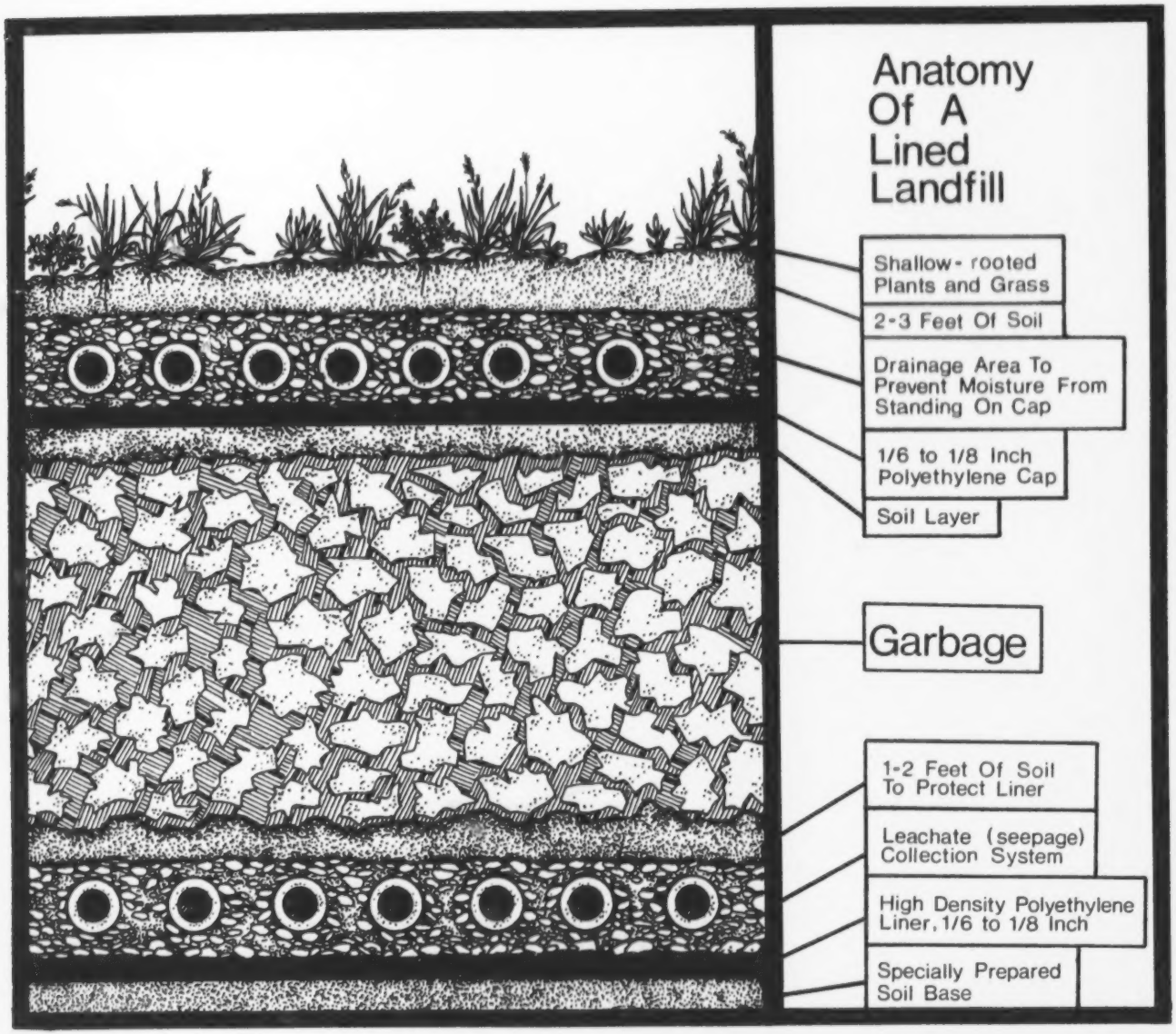
Landfill Chart

Observed Changes by Week

List Items in Landfill	Week 1 Data	Week 2 Data	Week 3 Data	Week 4 Data	Week 5 Data	Week 6 Data

Examples of Changes
- No Change
- Change of Color
- Decaying
- Disappearing

Percolation Experiment			
	Sand	**Clay**	**Plastic Lined**
Time Water Poured			
Time Water Stops			
Total Minutes to Filter Through			
Amount of Water Poured Into Funnel			
Amount of Water in Jar			
Amount of Water Absorbed by Soil			
Color of Water in Jar			


Anatomy
Of A
Lined
Landfill
Shallow- rooted
Plants and Grass
2-3 Feet Of Soil
Drainage Area To
Prevent Moisture From
Standing On Cap
1/6 to 1/8 Inch
Polyethylene Cap
Soil Layer
Garbage
1-2 Feet Of Soil
To Protect Liner
Leachate (seepage)
Collection System
High Density Polyethylene
Liner, 1/6 to 1/8 Inch
Specially Prepared
Soil Base

Lesson 15: NIMBY and NIMET

Purpose: To become aware of the politics involved in finding a site for a landfill.

Time: 45 minutes

What You'll Need:

1. Chairs and possibly tables for skit props
2. Scripts for students
3. Identification tags to hang around the actors' necks, if desired
4. Gavel
5. Map of the site
6. Book for report
7. Signs for the Keep Out Of Beauty Spot group (KOOBS)

Before the Meeting:

1. Review the Background Information.
2. Determine who will play the different roles in the skit.
3. Explain why both male and female names are listed.
4. Set up the room with elected officials at the table and a set location for participants in the public hearing.

Background Information:

- Landfills are an essential waste disposal method. In some communities, they are the only method; in others, they may be one part of a solid waste management plan that includes waste reduction, recycling, composting, and incineration with energy recovery.

- Finding a suitable site for a landfill requires considerable planning so that environmental problems can be minimized. In addition, the common public perception that a landfill is nothing more than a hole in the ground can create problems for elected officials responsible for selecting the landfill site. Because landfills are expensive and unpopular, these officials often delay locating them for as long as possible, a tactic referred to as NIMET: Not In My Elected Term.

- Apprehensions about water pollution, odor, animal problems, increased traffic by garbage trucks, increased litter, and decreased property values

generally make communities wary about having a landfill in their borders. Such resistance is often referred to as the NIMBY syndrome: Not In My Back Yard.

Lead-in: Today we will be putting on a play. It will demonstrate the role politics plays in making decisions about where a landfill is located. The play depicts a public hearing. Such hearings are held to discover what citizens think, to educate the public, to plan and evaluate programs, and, most importantly, to ensure the democratic process. The play will present a number of viewpoints. Two that you will want to note are NIMBY (Not In My Back Yard) and NIMET (Not In My Elected Term). (Write these phrases on the board.) During the play, think about which characters are NIMBYs and which are the NIMETs.

Play: Present "NIMBY and NIMET: The Landfill Question."

Let's Talk About It:

1. Who were the NIMBYs?
2. Who were the NIMETs?
3. Why is it hard to find a site for a landfill?
4. How did you feel about the different characters?
5. What were some of the issues that concerned the citizens about the landfill?
6. How did the public hearing work?

Where to From Here? Take your class to a public hearing.

Lesson 16: A Field Trip To The Landfill

Purpose:

1. To gain experience in landfill and design operations.
2. To become aware of criteria and statistics particular to local landfills.
3. To understand that landfilling is a scientific process necessary to the disposal of solid waste.

Time: 1 hour (depending upon logistics and travel time)

What You'll Need:

1. Student reporter sheets
2. Specific directions to the landfill
3. An appointment to visit a landfill official, such as a county engineer, a county manager, a landfill supervisor, or a solid waste administrator (Send a cover letter and a list of the questions you would like addressed.)
4. Transportation
5. Camera and film for the class photographer
6. Paper and pencil for each group
7. If a trip is not possible, have a guest speaker come to the class. Prepared questions can be addressed during the visit.

Before the Meeting:

1. See the videotape *Trashbusters.*
2. Review information on local solid waste generation: tonnage per day, per capita generation, available landfill space, and so on; also, estimate what percentage of the landfill volume is taken up with recyclables.
3. Finalize your appointment with the landfill official.
4. Send your landfill official a copy of the questions in advance.
5. Check with your landfill host about inviting media. Invite the media to attend with your class.
6. Finalize transportation plans for the class. Be sure to check seat belts and other safety considerations.
7. Assign class photographer.
8. Divide the class into four teams: financiers, good citizens, future planners, environmentalists. Each team should have a chief reporter and a list of particular questions to ask during the visit.
9. Assign each team to ask questions during the visit.

Background Information: Read Background Information in "Trashbusters" lesson.

Procedure:

1. Provide the class with national landfill statistics.

2. Explain that this field trip will allow them to learn about their local landfill operation.
3. Distribute question sheets to the chief reporter in each group. The group will become familiar with its particular questions, so that each team member can help record the answers.
4. Give class photographer guidance on what pictures to take.
5. Have the landfill official make a few opening comments.
6. Conduct the question-asking session so that each group has a chance to have their questions answered. The official should already know which questions will be asked.
7. Make sure the group thanks the official at the end of the visit.
8. Have students write thank-you letters to the official that you interviewed, mentioning three facts they learned and their concerns for the future.

Let's Talk About It:

1. Have teams report on the answers they get.
2. Discuss how landfills have to follow governmental requirements to protect the environment.
3. Discuss how the class can help alleviate the solid waste crisis.

Where to From Here?

1. Have students survey the amount of waste their families produce.
2. List and practice ways to reduce waste at home and in the classroom.
3. Write to the city council or the county commissioners to express the class's concerns about diminishing landfill space and the need for waste reduction.
4. After the photographs are processed, create a bulletin board in a main hallway of the school to inform other students and staff about landfilling.

Questions

Good Citizens:

- How big is the landfill?
- Who uses it?
- How much waste is brought here per day?
- How can we help to extend the life of the landfill?

Financiers:

- How much did the land cost?
- How much does it cost to run it?
- Is there a charge per ton to dispose of waste here?
- What factors determine the cost of running the landfill?
- Who determines the charges?
- Can recyclables be brought to the landfill?

Future Planners:

- How many years will this landfill operate?
- Is any of the waste recycled to save landfill space?
- Is there any plan to reduce the amount of waste disposed in the landfill?
- What happens when this landfill is full?

Environmentalists:

- What is done to protect areas around the landfill (groundwater and adjoining land)?
- Does the landfill have a way to vent gases that build up?
- Does the landfill accept any type of waste?
- What happens to hazardous waste?
- Why is the landfill considered scientific?

Your Name
Your Address
Your Town, N.C Zip Code

Landfill Official
Address
Town, N.C. Zip Code

Today's Date

Dear Landfill Official:

Our _____ grade class at _____ School is studying national and local solid waste issues. We have studied the national issues on landfilling and would like to have a first-hand look at our local landfill operation.

We would like to schedule a field trip (or have someone visit our class) on _____ from _____ to _____. Please contact me to confirm this time.

Also, we are enclosing a list of pertinent questions that the students will ask during their visit.

Thank you for your time and expertise.

Sincerely,

Teacher's Name
School Telephone Number

GLOSSARY

aerobic	chemical or biological process occurring in the presence of oxygen
aluminum	a strong, light, silver-colored metal
Aluminum Recycling Steps	aluminum is flattened into cakes or shredded, melted, and formed into new products, such as cans and storm windows
anaerobic	taking place in the absence of oxygen
ash	a byproduct of burned waste
bacteria	single-celled, microscopic organisms with rigid cell walls; can be aerobic or anaerobic; can cause disease; can be important in the stabilization and conversion of solid wastes
biodegradable	a term describing a substance or material that can be broken down into simple compounds by microorganisms
BTU	British Thermal Unit; the amount of energy required to raise the temperature of 1 pound of water 1 degree Fahrenheit
collage	an artistic composition in which a variety of materials are pasted or formed to create a picture or an image
commingle	to mix together
compacters (landfill)	heavy machines that drive over the solid waste in landfills and reduce the volume
compost	a mixture of soil and decomposed organic materials, such as leaves and food scraps, that may be used as a soil conditioner
conservation	the use and protection of such natural resources as forests, water, and air
consume	to use up something
contaminate	to make impure or unfit
cullets	small pieces of crushed glass; they are a stage of recycled glass
cycle	circle; return; occur again

decompose	to break down, decay, or rot
disposal	getting rid of solid waste
dump	an unpermitted, illegal land site where solid waste is disposed of in an open manner and left exposed to decompose
energy	the ability to do work
environment	all surroundings
EPA	abbreviation for Environmental Protection Agency, a federal agency whose purpose is to protect the environment
food waste	unwanted and discarded food scraps
fossil fuels	oil, coal, and natural gas — three nonrenewable natural resources
garbage	food and trash to be thrown away
geology	a science that deals with the structure and history of the Earth and its life, especially as recorded in rocks
Glass Recycling Steps	the glass, sorted to color, is shipped to a plant where it is crushed, cleaned, and melted at high temperatures, then formed into new glass products
hydrogeology	a science dealing with the properties, distribution, and circulation of water on the surface of the land, in the soil, and in rocks
incinerator	burning facility
landfill cell	a scientifically planned area dug into the landfill to bury solid waste
landfill scales	equipment that weighs the waste that goes into the landfill
leachate	liquid from solid waste that goes through the soil and may contaminate water
litter	solid waste that people have misplaced

loam	a soil mixture composed chiefly of clay, silt, and sand
logo	a distinctive and easily recognized trademark or symbol
methane gas	a colorless, odorless, flammable gas formed by decomposing organic matter; it is present in landfills
MRF	abbreviation for materials recovery facility; a place where recyclables or mixed solid waste is sorted for recycling
monofil	area designated for disposal of sludge from waste treatment plant
mulch	a protective covering (such as sawdust, compost, or paper) spread or left on the ground to reduce evaporation, maintain soil temperature, prevent erosion, control weeds, or enrich the soil
municipal solid waste	material discarded by communities or individuals
natural resource	material found in nature; examples are forests, water, air, minerals, and fossil fuels
NiCad	nickel-cadmium substance used in batteries (cadmium is toxic)
NIMBY	Not in My Back Yard; an attitude of communities toward landfill sitings
NIMET	Not in My Elected Term; an attitude of some elected officials toward landfill sitings
nonrenewable resource	natural materials that cannot easily be replaced; an example is fossil fuel
organic waste	waste composed of plants, animals, and carbon compounds such as paper, wood, and food
percolation	the movement of water through the soil
photodegradable	the process by which a substance or material can be broken down into simpler compounds by exposure to light
photosynthesis	a series of chemical reactions in which green plants combine energy from the sun with carbon dioxide and water to produce sugar and oxygen; the way plants capture and store energy
pollute	to make the environment unsightly, unhealthy, or unsafe
precycle	the conscious buying of products that reduce the volume of waste sent to the landfill

recyclables	items that can be reused or recreated into new products
recycle	to collect used products and make them into new products
recycling center	a facility where recyclable items are collected and sorted
reduce	to make smaller
renewable resource	natural materials that can be replaced; trees are renewable resources
resource recovery	the removing of reusable or recyclable materials from the waste stream
reuse	to use again
sanitary landfill	a disposal site where solid waste is buried
slogan	a brief, attention-getting phrase used in advertising or promoting
solid waste	all useless, or discarded material, trash, garbage, and debris
solid waste management	the controlling, handling, utilization and ultimate disposal of solid waste
ton	a measure of weight equal to 2,000 pounds
transfer	to move from place to place
trash	solid waste
volume	the space something occupies
waste stream	anything that must be disposed of after it has been used
waste-to-energy	the burning of solid waste to produce energy
weight	a unit of measure usually expressed as pounds or tons
white goods	household appliances, such as washing machines, dish washers, refrigerators, and other large objects, the metal of which is recyclable
yard waste	leaves, grass clippings, limbs, and so forth

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Answers

Lesson 6:

1. 1 cent
2. 1 cent, 10 cents, 20 cents, 25 cents, 50 cents
3. $1.00
4. 400 pounds
5. 60 cents
6. 70 cents, $7.00, $14.00, $17.50, $35.00
7. Aluminum

Lesson 7:

Give a hoot! Don't Pollute.
Greyhound. Leave the driving to us.
Fly the friendly skies of United.
We do chicken right. (Kentucky Fried Chicken)
Double your pleasure. Double your fun. (Doublemint Gum)
You deserve a break today at McDonald's.
Let your fingers do the walking. (Yellow Pages)

Lesson 10:

1. $35.00
2. 208.33 days

Notes

Credits

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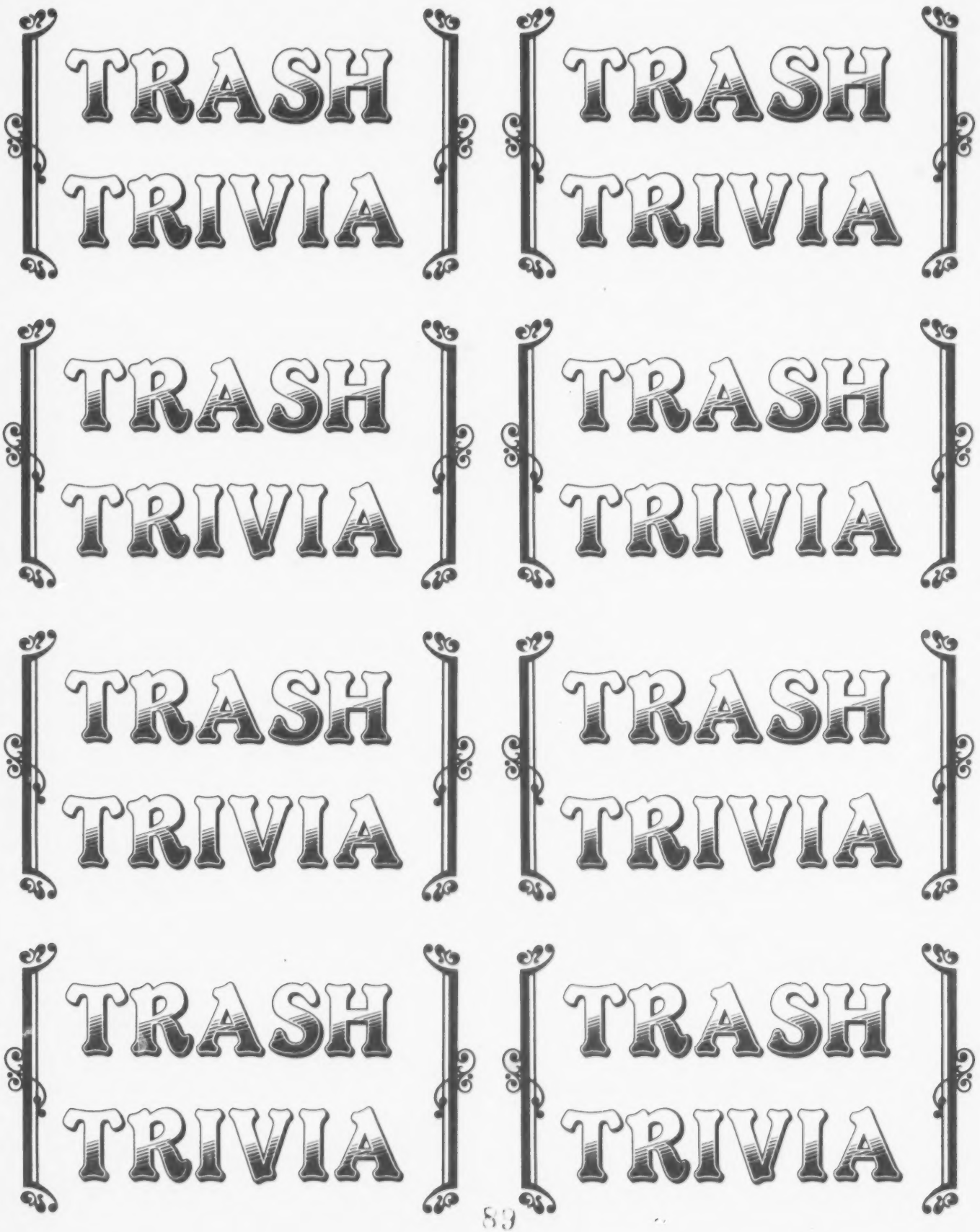
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Where are people more likely to litter? a. in an area where litter has already started to collect* b. along a clear roadway	Name the North Carolina project that recruits volunteer groups to clean up littered roadways. Adopt-a-Highway
What percentage of the nation's waste is put into landfills? a. 95 percent b. 47 percent c. 85 percent*	Uncovered trucks are a major source of roadside litter. *True False
Soft drink bottles can be recycled into what product? Sleeping bag insulation	Plastic containers can be recycled into refuse containers, flower pots, and plastic pipe. *True False
Bauxite ore is mined to make what important recyclable product? Aluminum	What is the term used for crushed glass? Cullets

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How many trees does it take to print the Sunday edition of the *New York Times*?

a. 65,000*
b. 5,000
c. 10,000

Name at least three things that can be recycled.

Glass, aluminum, and newspaper can be recycled.

Landfill space in the United States is plentiful.

True *False

Name two household items that can be added to a compost pile.

Coffee grounds, food scraps, grass clippings, and leaves can be composted.

How much trash does one person generate in one day?

a. 5 pounds*
b. 1 pound
c. 9 pounds

What can cool your home in summer, keep it warm in winter, and increase your home's value by 20 percent?

a. a paved driveway
b. trees*
c. a sidewalk

What percentage of normal household garbage is recyclable?

a. 15 percent
b. 100 percent
c. 30 percent*

Green, clear, and brown glass is 100 percent recyclable.

*True False

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Making products from recycled materials requires far less energy than making them from new, unused materials.

*True False

There is no way to protect groundwater from landfill leachate.

True *False

(Liners of plastic or clay are being used and are required by the Environmental Protection Agency.)

Many items discarded in household waste are hazardous.

*True False

(Examples include motor oil, drain cleaners, insecticides, and laundry products.)

Most people never think about what happens to their garbage after it leaves their homes.

*True False

Solid waste can be hazardous if it is improperly disposed.

*True False

(It can become a breeding ground for mosquitoes, rodents, and other pests. It can contaminate groundwater and surface water.)

There is no harm in using the ocean as a giant garbage dump.

True *False

Industrial wastes pose no threat to wildlife.

True *False

How many trees can be saved by recycling 1 ton of newspaper?

a. 3
b. 17*
c. 50

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Litter can kill wildlife. *True False	Birds and mammals may die after eating or becoming entangled in debris. *True False
Name one reason you might not want a landfill close to your home. Odor, noise, heavy truck traffic, and possible groundwater contamination are some reasons.	Composting is a method of recycling. *True False
There is little I can do as a student to help solve the solid waste problem. True *False (1. Don't litter. 2. Encourage your family to recycle. 3. Be willing to clean up another's mess.)	Incineration eliminates the need for landfills. True *False (Items such as cans, metals, and concrete cannot be incinerated.)
What word describes the recovery and reuse of materials which would otherwise be thrown away? recycling	What liquid byproduct of solid waste goes through the soil and may contaminate surface and groundwater? a. Methane b. Leachate* c. Dioxin

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What will decompose first in a landfill: an aluminum can or an apple core?

an apple core

Beautification can prevent littering.

*True False

What material is used to package food products?

Glass, plastic, and paper are all correct answers.

What is the scientific method for burning garbage at very high temperatures?

incineration

Littering is an act that is the result of a certain set of attitudes.

*True False

How long does it take a plastic or aluminum drink container to biodegrade (decompose or rot)?

a. 2 years
b. 50 years*
c. 300-500 years

The average family accumulates _____ pounds of newspaper per month.

a. 10
b. 30*
c. 5

Garbage disposal is a serious national problem.

*True False

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What government organization sets guidelines for the safety of landfills?

EPA — Environmental Protection Agency

An incinerator can be a power plant.

*True False

Litter is misplaced solid waste.

*True False

Electricity or steam can be generated and sold.

*True False

Are empty jars and aluminum cans worth money?

Yes. Recycling companies will buy them.

Name at least one potentially dangerous byproduct produced by the decomposing materials in a landfill.

Methane gas, carbon dioxide, and leachate are all correct answers.

Which of the following is hazardous waste?

a. newspaper
b. yard waste
c. batteries*

What colors of glass are recyclable?

Brown, green, and clear are all correct answers.

SE

NIMBY *and* NIMET:

The Landfill Question

A 4-H Play on Solid Waste Issues

SE053086

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CHARACTERS:

Preston/Pam Pleaser
Frances/Fred Future
Clara/Clyde Chairman — *County Commissioners*
Pat Planner
Perry Pride
Additional Commissioners

Matthew/Mary Manager
Ed/Erin Engineer
Calvin/Cathy Consultant
Frank/Faye Farmer
Priscilla/Peter Principal
Bill/Beth Builders
Cary Community
Evelyn/Everett Environment
Sissy/Sam Citizen
Larry/Lucy Leader
Karen/Keith Committee
Sherman/Sherry Shippit
Rita/Randy Recycler

Solid Waste Advisory Committee (unlimited number)
Farmers' Organization (unlimited number)
Community Group (KOOBS) (unlimited number)

Note: *Allow time for Solid Waste Advisory Committee to meet Karen/Keith Committee, Farmers' Organization to meet Frank/Faye Farmer, and Community Group to meet Cary Community.*

Setting: *County Commissioners' public hearing to receive community input on locating the new county landfill on the Community Pride Road in the Beauty Spot area of Hometown, U.S.A.*

Clara/Clyde Chairman: *(Bang the gavel on the table)* We will now begin the public hearing on the proposed landfill location on Community Pride Road in the Beauty Spot area of Hometown, U.S.A. Mr./Ms. Manager, would you and your staff present the details about the proposed site?

Matthew/ Mary Manager: Our staff and C & C Engineering Consultants have been working for over 1 year to locate possible sites for our new landfill. After examining a number of sites, we are proposing that the board consider the Community Pride site because of its location and availability and because the risk of damage to the environment is limited. I have asked Ed/Erin Engineer and Calvin/Cathy Consultant to present additional details.

Ed/Erin Engineer: After examining the various sites, we are recommending the Community Pride site. It is located *(point at map)* in the center of the county, making it equally close to many of our 15 towns, a fact that will cut transportation costs. The highway system can easily handle the 300 garbage trucks per day from all over the county. The population in the area is low, and most of the land in the area is now used for farming. You can see that there are no streams on or next to the 400-acre area, so water contamination should not be an issue. Along with the liners that we will use in the landfill, every effort will be made to protect the environment. Calvin/Cathy Consultant will now give you more details.

Calvin/ Cathy Consultant: You received a copy of our report *(hold up thick book)* before the hearing today. We have studied the impact of a landfill on the proposed site. We have examined the soil

types, the impact on surface water and groundwater, the plant and animal life in the area, the highway system, the type of businesses in the area, and the population. We recommend locating a landfill on Community Pride Road in the Beauty Spot area. The landfill will not damage the environment because we will use state-of-the-art methods. Such methods include liners and leachate collection systems.

Clyde/Clara Chairman: Thank you Mr./Mrs. Engineer and Mr./Mrs. Consultant for reviewing the information on the site. We have a number of citizens who have asked to address the board during our public hearing. We will begin with Karen/Keith Committee.

Karen/Keith Committee: Mr. Chairman, board members, I am Karen/Keith Committee, the chairman of the County Solid Waste Advisory Committee that was appointed by you, the Board of County Commissioners, to review

recommendations on solid waste. Several other members of our committee are present. Will you please stand? (*Committee stands.*) We have reviewed the plan to locate the landfill on Community Pride Road, and we support that plan. Other sites were either in more densely populated areas or in areas that posed more threat to the environment. Our committee would like to go on record in support of the Community Pride site.

Frank/Faye Farmer: I am Frank/Faye Farmer. My family has farmed in the Beauty Spot community for over 150 years. I am also president of the Hometown Farmers' Association, which has over 200 members. Members of our Farmers' Association Board are here tonight to strongly object to locating a landfill in the Beauty Spot community. This is the most productive agricultural area in the county, and we need to preserve the land for farming. The site is prime agricul-

tural land. Not only will the landfill take the land out of agricultural production, but it will encourage these businesses that make a lot of waste to locate in our area. We are also concerned about the increased traffic. Pride Road is used by many of our farmers, and tractors, combines, and other farm equipment travel that road. Finally, we are worried that the landfill may damage the groundwater in the area; we all depend upon well water for our families and livestock.

Priscilla/ Peter Principal: Mr. Chairman, I am Priscilla/Peter Principal. The faculty at Community Elementary School is concerned that our children may be threatened with the increased traffic caused by the landfill. We have 15 bus stops along the Community Pride Road, and many of our parents travel the road when they bring their children to school. The school is located 2 miles from the proposed

entrance to the landfill, on Education Drive.

Sherman/ Sherry Shippit: I'm Sherman/Sherry Shippit, and I don't know why we need a landfill in our county. Let's just ship it to the next county or maybe Texas, Kansas, or North Dakota. They have plenty of land. We don't need to keep our garbage here. Just ship it away.

Bill/Beth Builders: Members of the Board of County Commissioners, I am Bill/Beth Builders. My company is constructing the 75-lot subdivision, Pride Ridge, just 1 mile from the proposed landfill. This is an exclusive development: Houses will sell for $200,000 and up. The residents of Pride Ridge are outraged. We presently have 25 homes completed and 10 under construction. By selecting this site, you will cause the value of these homes to drop immediately. The residents will be unable to sell. I will go bankrupt if we can't develop the rest of the lots.

I am pleading with you—Don't locate the landfill at the Community Pride site!

Cary Community: Mr. Chairman, I am Cary Community, chairman of KOOBS, Keep Out Of Beauty Spot. Many of our members are here. *(Stand up with signs and posters.)* We don't want a landfill in our community. No matter what you say, we are afraid a landfill will pollute our water, smell bad, attract rats, and cause litter. We have a good, strong community, and we are sick and tired of having the county dump everything here. You don't want it in the rich, southern part of the county; well we don't want it either. Keep out of our Beauty Spot!

Rita/Randy Recycler: I am Rita/Randy Recycler. I feel that the County Commissioners should take a close look at how we can reduce the amount of solid waste going into the landfill. Recycling is an effective way to make that

reduction. By recycling we can extend the life of our landfill wherever it is located and find new uses for things we are throwing away.

Evelyn/ Everett Environment: I am Evelyn/Everett Environment of the Upper State Environmental Concern Organization. I would first like to commend the commissioners for your environmental concern. Your consultants have done a lot of work looking at environmental impacts, but they overlooked one important item, the Frizzy Fancy Fern. The proposed site is one of only four remaining identified locations in our state where the Frizzy Fancy Fern is growing in its natural habitat. Consequently the Upper State Environmental Concern Organization plans to take whatever steps necessary to stop the county from developing a landfill at this site. We must protect our endangered species.

Sissy/Sam Citizen: I am Sissy/Sam Citizen. I would like to commend the Board of County Commissioners for the foresight you have in planning for waste disposal in our community. You are thinking ahead and trying to solve problems so our children will not be faced with them. I support your decision to locate the landfill in the Beauty Spot area.

Larry/Lucy Leader: I am Larry/Lucy Leader of the Business and Commerce Board. I would like to support the Commissioners' decision. For our community to grow, we MUST have a sound system of waste disposal. It will be a selling point to businesses and industries looking at our community as a place to locate. We need new jobs, and we support the proposed site.

Clara/Clyde Chairman: Are there others who would like to speak at the public hearing? *(Pause.)* If not, we will close the hearing and go into our regular business session. The first item on the agenda is

where to locate the proposed landfill. *(Commissioner Future raises hand.)* I recognize Commissioner Future.

Frances/ Fred Future: I would like to make the motion that the county proceed with plans to construct our new landfill at the Community Pride Road site in the Beauty Spot community. We must move forward on the project to make sure that proper time is allowed for licensing the landfill before we run out of landfill space.

Pat Planner: I second that motion. We must move forward immediately. We have been planning the landfill for 3 years. It's time to bite the bullet and vote on the site.

Clara/Clyde Chairman: Is there discussion?

Preston/ Pam Pleaser: I think we need to get more information about the Frizzy Fancy Fern and the concerns about traffic. Isn't there another location? I feel sorry

for these people. Maybe we should wait a few months and see what other information might come up.

Perry Pride: I represent this community. As you know, I have opposed this site since day one. It will destroy our community. There is no way I can vote "yes."

Frances/ Fred Future: I call for the vote.

Clara/Clyde Chairman: Is there any more discussion? If not, those favoring the motion that the county proceed with locating the landfill at the site on Community Pride Road in the Beauty Spot community, raise your hand. *(Pause.)* Those opposed raise your hand. *(The chairman counts the votes. The motion carries or does not carry, according to vote.)*

Meeting adjourned.

Prepared by: Martha A. Burris, Director, Gaston County office of the North Carolina Agricultural Extension Service

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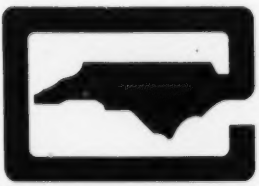

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